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ON A NEW GENUS OF ALGÆ, CLEMENTSIA MARKHAMIANA.*

By GEORGE MURRAY, F.R.S.

It was a great pleasure, and I might be excused for thinking it a triumph, that the first new organism which fell to the bag of the *Discovery* should have fallen to my personal share. A new species would have been welcome. My delight was the greater when I realized that I was face to face with a new generic type. This realization did not come at once. In looking into my diary, I find that for a whole day I puzzled over the possible relationships of this organism, unwilling as I am to think a type new; to think I should be the first to see something no human student of pelagic organisms should have seen before, and this a generic type! If a personal reference in one sentence may be excused, I may claim the permission to recall a day of restraint when I tried to disguise from Captain Scott (who had taken an active interest in the microscopic study of plankton) and from Dr. Koettlitz my hopes and, it may be, my fears. The next morning's tow nettings brought in mature forms, which enabled me to decide once and for all that the *Discovery* had captured a new type of pelagic organism—a generic type which can most fittingly bear the name of the man who initiated the *Discovery* Expedition; the name is *Clementsia Markhamiana*.

There were many who did their best; the President did his best so conspicuously from the first that it is fitting his name should be that of this first organism to be named after the expedition.

On the next day, to my great delight and particular pleasure, Dr. Koettlitz discovered a new species of Peridinian. I had thought the ocean was exhausted of Peridinians; they were my own particular preserve, and here was my own particular pupil in such matters, Dr. Koettlitz, beating his master on his own ground. With his characteristic modesty, he met me on the deck for a verification, and

* In the plate the name is incorrectly given as *Clemensia*.

scarcely before I had spoken, Dr. Koettlitz had announced a new species, to be called after our captain. This species Dr. Koettlitz will describe in due course.

The original drawings of *Clementsia* were made by Dr. Wilson at the time of its capture, and the engraving is by Mr. Highley.

The particular interest in this type is not only its unique character as an oceanic plant, but its significance from the point of view of the geographical distribution of such organisms. There are allied forms, both Gloeocapsoid and Chlorococcoid—not well defined for the most part—on sea-shores, but I have never met with, either under the microscope at sea (I mean the high seas) or in botanical records, anything nearly related to *Clementsia*. Its nearest allies are from fresh water, and this fact alone will account to any naturalist for my day of bewilderment mentioned above.

The difficulty that arises in interpreting the development and life-history of pelagic organisms is this: one cannot submit them to the normal tests of cultivation, as one would do with fungal and bacterial organisms, or with fresh-water algæ. The only real groundwork to go upon is the assembling of numerous specimens, and the intelligent understanding of these specimens in their various stages by the light of the known life-history of allied forms. This must be done in the case of *Clementsia*, and I shall try to show what I take to be its course of development.

Fig. 1 shows what I take to be the youngest stage in which the cells are living in association—in colonies—enveloped in a common mucilaginous membrane. In Figs. 2 and 3 we see (much more highly magnified) the process of subdivision of the cells, a division into fours, and especially in Fig. 3 these forms are displayed in an encysted, stratified integument. The next ascertained stage is Fig. 4, in which we have the escaped cells grown much larger and free, and—such is my interpretation—about to give birth, or inevitably destined to give birth, to a colony like that shown in Fig. 1. This interpretation is based, of course, on known facts in the life-history of allied forms. No man can tell from the available material what may happen between the stage shown in Fig. 4 and the establishment of the colony shown in Fig. 1. The magnification is identical. It will be seen there is a great increase in size in these cells from the subdividing stage in Figs. 2 and 3, as would be expected in a stage about to establish a colony such as that shown in Fig. 1.

Clementsia Markhamiana, nov. gen. et spec.

Units existing in colonies within a stratified integument, dividing into groups of four, varying much in the numbers of the colony; the integument gradually growing in thickness and in stratification, ultimately bursting and permitting the escape of the unit cells; unit

cells increasing in size markedly and (presumably) subdividing into colonies like the parent colony; in nearly every stage characterized by the thick and many times stratified walls of the integument, and especially also by the abundant oily and chlorophyllaceous contents of the cells.

Lat. 7° S. to 12° S.; long. 30° W. to 33° W.

ON CERTAIN RECENT CHANGES IN THE CRATER OF STROMBOLI.

By TEMPEST ANDERSON, M.D., D.Sc.

In 1875, Prof. Judd, F.R.S., published in the *Geological Magazine* an admirable series of articles entitled "Contributions to the Study of Volcanoes."

The part dealing with the Lipari islands has been my constant companion and guide during two visits to those islands in 1888 and 1904, and it deals so fully with the subject, both from a historical and scientific point of view, that I feel it would be presumptuous to attempt to paraphrase the excellent description which he has so well written. Since his visit, however, Stromboli has continued in its wonted activity, generally of a moderate character, and so regular that it might almost be called rhythmical, though occasionally varied with periods of violence, and sometimes of almost total quiescence. As a result, certain changes have occurred in and about its crater; not on any very large scale, it is true, but sufficient to be of interest. When I visited the islands in 1888, I carried with me a camera, with which I took photographs * from selected points of view, believing that I was thus securing records more accurate and unbiassed than any mere verbal description; and in 1904 I revisited the islands, carrying the same camera and lenses, and took comparison photographs from as nearly as possible the same positions. These photographs form the basis of this paper, and have been supplemented by several other photographs and diagrams placed at my disposal by Prof. Riccò, of the Reale Osservatorio, Catania, and Mr. Geo. S. Eunson, of Northampton, who visited the volcano with the Geologists' Association in 1889. These fill up the gaps and show the changes during the intervening years.

Believing as I do that photographs should themselves form the record, and that the letterpress should be mainly explanatory of them, I have placed opposite each plate a note calling attention to the main points shown, and prefaced the whole by such a description of the island as may serve to make my story intelligible. To this I have added a summary of the main changes noticed.

Stromboli is the most easterly and northerly of the Lipari islands. It is situated north of Sicily, close to the track of steamers plying

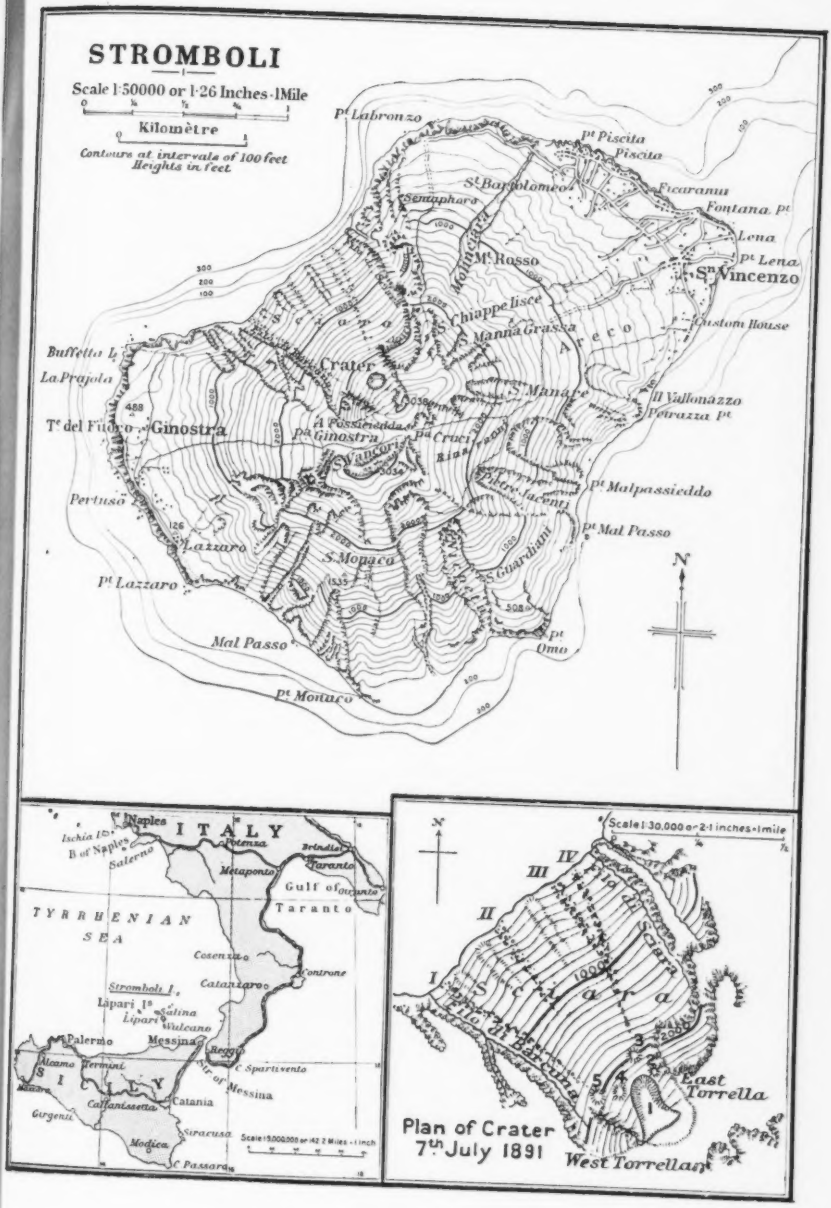
* See 'Volcanic Studies by Tempest Anderson.' Plates xx. to xxvii. Murray: 1903.

between Naples and the Straits of Messina, and is thus an object familiar to passengers to or from Egypt or the East, though comparatively few have landed on its shores. Its almost constant eruptions have gained it the name of the lighthouse of the Mediterranean. It is almost circular, as its old name Strongyle indicates, and rises as an irregular cone out of deep water. On the north-west side is the crater, "Apparato Eruttivo," of the Italian observers, and the Sciara or steep slope down which the ejecta roll into the sea. The Sciara is bounded on each side by two steep cliffs, Filo di Sciara and Filo di Baraona, which are formed, like the Sciara itself, of lava-streams, agglomerates, and dykes; in fact, of almost every kind of compact volcanic material, chiefly of basic composition.

The summit of the mountain consists of a crescentic ridge, the Serra di Vancori, open towards the north. It forms part of an old crater ring, and thus presents points of similarity to Somma. Inside the crescent ridge, and in places joined to it by irregular crests of rock, but mainly separated from it by a valley, "A Fossieiedda," similar to the Atrio del Cavallo of Vesuvius, is another crescentic ridge, which, on my first visit in 1888, in many places immediately surrounded the active crater, the bottom of which was visible therefrom. In 1904, owing to changes presently to be described, this view was not obtainable.

Connected with its two extremities, and immediately overlooking the sides of the crater, are two conspicuous pointed rocks, the Torrelle,* which partly obstruct the view of the crater when viewed from the cliffs overlooking the Sciara on its north-east and south-west respectively. These Torrelle, being practically unaltered by ordinary eruptions, present good points of comparison for estimating the changes that take place, and one or other of them is included in most of the photographs. Between the two Torrelle, in the midst of a sort of amphitheatre formed by them and the crescentic ridge last mentioned, is the crater and its appurtenances, "The Apparato Eruttivo" of Italian observers. This amphitheatre is open to the north-west, and from its open side beyond the craters the steep slope of the Sciara extends down into the sea. This Sciara, as is well known, is one of the most peculiar features of this volcano. It extends at an angle of about 35°, which is the "angle of repose" for the kind of material of which it is composed, down into the deep water of the Mediterranean; and though the volcano has certainly been in almost constant eruption during the whole of the historic period and probably much longer, it has never been able to build up a talus sufficient to rise to the level of the sea, much less to that of the lip of the crater, about which, according to the analogy of other volcanoes, it might have been expected to have built up a cone on this side comparable to the portion on the south described above,

* We heard these rocks called by the natives Torrelle ["little towers"] and Torrione ["big towers"]. They are spoken of by Profs. Riccò and Mercali as Faraglioni.


STROMBOLI
Scale 1·50000 or 1·26 Inches = 1 Mile
Kilomètre
Contours at intervals of 100 feet
Heights in feet
Pt Labronzo
Pt Piscita
Piscita
St Bartolomeo
Semaphore
Ficaranu
Fontana Pt
Lena
Pt Lena
M. Rosso
S. Vincenzo
Custom House
Chiappe Iisce
Manna Grassa
Buffetta I.
La Prajola
Crater
Fossa
Pt Ginostra
Ginostra
Pt Cruci
Vancori
Fabrei Iacenti
Pt Malpassieddo
Pt Mal Passo
Pertusa
Lazzaro
S. Monaco
Pt Lazzaro
Guardiani
Mal Passo
Pt Omo
Pt Montaro
Il Vallonazzo
Pirazza Pt
N
Naples
ITALY
Ischia I.
B. of Naples
Salerno
Brindisi
Taranto
Metaponto
Gulf of Taranto
TYRRHENIAN SEA
Cosenza
Crotone
Catanzaro
Stromboli I.
Lipari Is
Salina
Lipari
Vulcano
Palermo
Messina
Cape Spartivento
Etna
Catania
Siracusa
Modica
C. Passaro
Scale 1:500,000 or 42 2 Miles = 1 Inch
Scale 1:30,000 or 2·1 inches = 1 mile
Sciara del Fuoco
Pizzo di Bastarina
East Torrella
West Torrella
Plan of Crater
7th July 1891

which cone in that case it would have completed. As it is, the summit of the mountain is about 3000 feet above the sea-level, while the eruptions take place about 600 feet lower, *i.e.* at a height of about 2400 feet.

When I first visited the mountain in 1888 (see Plate II., which is from a photograph taken by me at the time), the crater was an oval hollow, which I afterwards roughly estimated at 60 or 70 yards in diameter, but which, on examining the place again in 1904, I believe to have been much larger. I made a second ascent to check this, but was prevented by bad weather from completing the observation. Prof. Judd's estimate of 400 feet was probably nearer the mark. In 1888 there were two small cones, one on the edge of the Sciara near its western end, from which the explosions took place, another in the hollow of the crater near its eastern end, which only gave out vapour. In 1904 the accumulation of materials thrown out by the volcano had filled this crater and continued the slope of the Sciara upwards, so that the explosions no longer took place from the hollow of the crater or even from its lip, but from mouths on the slope of the Sciara. I have no reason to think that the main axis of eruption has shifted materially down the Sciara towards the sea, notwithstanding the appearance to the contrary, which is, I believe, due to the piling up of fragments to the south-east of the vents on the site of the crater seen in 1888. It is interesting to note that in 1888 the fumarolic activity was chiefly at the north-east of the crater, then a hollow, and the explosions took place from the western portion. In 1904 the relation still continues; the fumarolic area, now much raised into a mound, as shown in Plate IV., is still at the north-eastern portion of the eruptive area, while the main explosions take place from the western parts. It is, however, noteworthy that the flow of lava in 1891 appears to have proceeded from the eastern part of the crater. These facts will have to be taken into account by any one who frames a new theory of the mechanism of Stromboli.

Since my return home, I have endeavoured to collect photographic and other information so as to fill in the changes which have occurred in the interval, and present them in a connected form.

Prof. Judd, F.R.S., has kindly placed at my disposal several papers from the *Atti della Società Italiana di Scienze Naturali*, by Prof. Mercali, of Naples, from which the following information is condensed.

On February 4–5, 1879, a severe eruption of Stromboli took place, and such a quantity of pumice was thrown out that the sea in the neighbourhood is stated to have looked like dry land. There is no mention of any lava being discharged.*

* Mercali, *Atti della Soc. Ital. di Sci. Nat.*, vol. **24**. Milano, 1881. This number contains a good list of the ancient eruptions of Stromboli and a discussion of Mallet's theory.

On November 17, 1882, and following days, a severe eruption took place. Towards the commencement there was an explosion more severe than any remembered by the inhabitants, and five new bocche opened on the north-west slope of the Sciara, about 100 metres below the usually active crater. Red-hot stones were thrown on to the southern slopes of the mountain, and one weighing several tons as far as Ginostra. On November 27 the eruption was so severe that the inhabitants thought of emigrating. No lava-flow took place. Mercali contrasts this fact with the usual sequence of events on Etna and Vesuvius.*

On February 25, 1888, there was a severe earthquake on Stromboli, and others on March 21 and May 22. They were local, and not felt on the other islands. Mercali concludes that they were connected with the local volcanic activity, although the eruptions continued with their usual degree of intensity, and that they were different from the Calabrian earthquakes. Such local earthquakes are common in the Lipari islands.

Mercali visited Stromboli in September, 1888, and found a single active crater. In February, 1889, he found the crater more active and notably changed. The bocca active in September, 1888, was now quiet and in a fumarolic condition, and three new bocche had opened on the edge of the Sciara, one of which gave eruptions with a rhythm independent of the others.

In June, 1891, Profs. A. Riccò, of Catania, and G. Mercali, of Naples, visited the island and embodied their observations in a valuable memoir† from which the plan is copied by permission, and the nomenclature and numbering of the bocche adopted by them has also been followed throughout this paper.

They found a large crater, No. 1, corresponding to that described above by myself in 1888, and figured in Plate II., and four smaller bocche on or about its northern edge at the lip of the Sciara. Bocche Nos. 2 and 3, towards the eastern side of the crater, were considered to be situated on one radial fissure, and they appear to correspond in position to the smoking cone of 1888, and to the fumarolic area observed in the same region in 1904. Bocche Nos. 4 and 5, towards the western portion of the crater, are described as situated on another radial fissure. They correspond in position to the cone from which the explosive eruptions took place in 1888, and to the bocche from which similar explosions still took place in 1904.

The writers also describe and mark three streams of lava, ii., iii., iv.,

* Mercali, *op. cit.*, vol. 27, 1884.

† 'Sopra il Periodo Eruttivo dello Stromboli, Relazione dei Professori A. Riccò e G. Mercali con appendice del Ingegnere S. Arcidiacono estratto dagli Annali dell' Uffizio centrale Meteorologico e Geodinamico,' Serie 2, Parte iii. vol. 11, 1889. Roma: Tip. dell' unione Coop., edit. 1892.

as having run down the Sciara in June, 1891, from bocca 3. It is noticeable that this discharge of lava took place from a bocca which usually is quiet and fumarolic in its action, and not from the usually explosive area 4 and 5.

In 1889 the English Geologists' Association visited Stromboli, and Plate V., from a photograph by Mr. G. S. Eunson, who was one of the party, shows that changes were already commencing.

Signor Guiseppe Renda, postmaster of Stromboli, informed me that about 1890 a stream of lava with three tongues issued from the crater and ran down the Sciara. He fixed the date as having been two years after the great eruption of Vulcano in 1898. This corresponds probably with the eruption described by Profs. Riccò and Mercali as above.

Scattered through the volumes of the *Bolletino della Societa Sismologica Italiana* since their commencement in 1895, are numerous notices by Prof. Riccò and Signor Arcidiacono, both of the Reale Osservatorio of Catania, on the state of the activity of the volcanoes of Sicily and the adjacent islands. These are virtually inaccessible to English readers, as only about two copies appear to find their way into this country, but, thanks to the courtesy of Prof. Milne, F.R.S., I have been able to abstract the following information.

1895. Stromboli was in its usual characteristic state of eruption, except that on March 29 a very violent explosion occurred in correspondence with a slight shock of earthquake felt in several places in Calabria. There followed towards the end of the year several violent explosions sufficiently severe to shake the island. A small stream of lava issued from the Sciara below the bocca 4 this year or in 1894.

1896. Stromboli was in its usual condition during the whole year, except that on July 13 there was a severe explosion, by which masses of incandescent lava and scoria were thrown to a great distance, and some damage was done to the vineyards by fires in consequence. The whole island was enveloped in a cloud of ash, and the noise was heard very plainly at Lipari. A slight shock of earthquake was felt at Palini, in Calabria.

1897. Nothing special was recorded.

1898. Stromboli was chiefly in its usual state. It was more active than usual in October, and unusually quiet in November. On September 14, 1898, Signor A. Semprivi Capo Posto Semaphoro di Stromboli ascended the mountain, and, all being quiet, was able to ascend the western Faraglioni (Torrella), commanding a good view of the craters from above, and found the relative positions of the bocche had not materially varied since the original report by Prof. Riccò, Mercali, and Archidiacono in 1891. No. 5 was still in action, but its direction somewhat changed, so that it could scarcely be seen from the semaphore. It appeared to be the point from which most of the larger explosions took place. On October 28, 1898, Prof.

Riccò ascended the mountain and observed a succession of eruptions. Four considerable ones, besides smaller ones, took place from bocca No. 5, some moderate ones from No. 4, while Nos. 2 and 3 discharged masses of smoke.

1899. Stromboli was mostly in its usual condition, with occasional increases of activity. There was a slight increase of activity at the beginning of February. On March 6 a very violent explosion occurred in one of the side craters, followed by the formation of two small cones in its floor, and on the following days increased activity continued. During this year Prof. Matteucci stayed nine days on Stromboli, and made six ascents. The eruptions all took place from a little eccentric cone on the southern slope of a large crater of explosion, probably 4, 4 bis, or 5, and there were six other bocche, but they only emitted smoke. The mountain was again active in November, and about the 10th of that month a new bocca, No. 6, opened on the Sciara below and to the north-east of No. 5.

1900. Stromboli was unusually active from March to November, especially in October. Many of the explosions were sufficiently powerful to shake the whole island and cover it with dust. The chief explosions were from bocche 4, 4 bis, and 5, all situated towards the western part of the Sciara. The later observations are not yet published, but Signor Liberator Castalan, syndic of Filicudi, whose house commands a full view of Stromboli, informed me that there was a severe eruption of Stromboli in December, 1903, and January, 1904, also others five and ten years previously. Between those times nothing special occurred, but the mountain was never absolutely quiet.

Signor Guiseppe Renda, Postmaster of Stromboli, also spoke of an eruption in November and December, 1903, during which a stream of lava ran down the Sciara from about December 10 to 20, and a new bocca formed on the north-eastern part of the eruptive area near the Torrione (Torrella?).

There was an earthquake in February, 1904.

1904. I stayed four days on the island, and ascended the cone on April 20 and 22. The photographs were taken April 20.

On May 30, 1904, Signor D. Vasalo, Capo Posto del Semaphoro di Stromboli,* made an ascent of the mountain, and, the craters being quiet, was able to ascend the eastern Faraglioni (Torrella), from whence he had a near view of the "Apparato Eruttivo." He found in the part which I have called the fumarolic area a new bocca, which he calls No. 7. It is about 20 metres east-south-east from bocca 2, and about 6 metres by 4 metres in extent. It was in a state of the weakest activity, and emitted whitish smoke, apparently being in a similar condition to that on April 20, when I photographed the locality, as shown in Plate IV.

* See *Boll. della Soc. Sism. Ital.*, vol. 10.

He also found the large crater No. 1 filled up as described above, probably during the eruption of November, 1903. It is very satisfactory to find my observations in this respect independently confirmed.

He also climbed the western Faraglioni (Torrella) and noted the condition of the western bocche, which were still the most active.

The following information, though not strictly scientific, may be of interest or use to intending visitors.

The southern part of the island is precipitous, and for the most part uncultivated. The north-eastern part is gently sloping, and presents a large village (St. Vincenzo), or perhaps rather a large straggling group of houses, with two churches, situated among vineyards. From the cultivation of these and from fishing, the inhabitants, who number perhaps 4000, derive a precarious livelihood. To the west of the village, and on a promontory near the eastern side of the Sciara, is a signal station maintained by the Italian Government, where the passage of vessels is recorded and reported. One of the officials here is charged with keeping a diary of the state of activity of the volcano, and he reports to Prof. Riccò, of the observatory of Catania.

The only other person who seemed to know anything about or take any interest in the doings of the volcano was the postmaster, Signor Guiseppe Renda.

There is another small village, Ginostra, to the west of the island. There is no inn on the island, but tolerable lodgings are obtainable at the house of Don Antonio Renda, who did his best to make us comfortable. A small steamer calls twice a week. It goes daily from Milazzo to Lipari, and some one or other of the islands, and there is a steamer once a week to Messina. There is no harbour, but passengers are landed in small boats. If the wind is unfavourable, landing is sometimes impossible.

We took as guide Francesco Conti from Lipari, who has been in America and speaks some English.

In conclusion, I wish to express my grateful thanks to H.I.H. the Archduke Ludwig Salvator of Tuscany, for allowing the reproduction of the map from his monumental work, 'Die Liparischen Inseln,' Siebendes Heft (Stromboli, 1896); to Prof. Riccò, of Catania, for much valuable assistance, and for permitting the reproduction of the inset plan of the crater and Sciara; to my valued friends Prof. Bonney, F.R.S., Prof. Judd, F.R.S, Prof. Milne, F.R.S., and George Yeld, my companion during the voyage, for much kind assistance and counsel; and to Mr. Geo. S. Eunson, of Northampton, for the use of the negative of Plate V.

PLATE I.

THE SERRA DI VANCORI, STROMBOLI.

(*From a Photograph by the Author*, 1904.)

In the distance to the right and in the centre is the crescentic range of cliffs forming the southern part of the old wall of the crater. It is composed chiefly of tuffs and agglomerates, with, I believe, a few small flows of compact lava. The slope in the foreground and to the left is part of the ridge overlooking the site of the crater existing in 1888, but now much filled up. It is composed of fragmentary ejecta, including many large masses of scoria and a few very perfect volcanic bombs. The depression in the distance to the left is the Purtedda di Cruci, over which the track from Ginostra leads down to San Vincenzo, the chief village of the island.

Purtedda di Cruci.

Portedda di Cruci.

Old Crater Wall.

STROMBOLI. THE SERRA DI VANCORI

Bocca 4.
Bocche 2 and 3.
PLATE II.

STROMBOLI : THE CRATER FROM ABOVE. 1888.

PLATE II.

STROMBOLI—THE CRATER FROM ABOVE.

(From 'Volcanic Studies,' Plate XXII., by Tempest Anderson.)

This photograph shows the condition of the crater in 1888. It was taken from the slope extending down from the north side of the ridge shown to the left of the last plate, towards the crater, and with the camera pointed in a northerly direction. Owing to the necessity of tilting the camera forward in order to obtain this view, the slope in the foreground is much foreshortened. It is in reality very steep—in fact, "at the angle of repose." The crater was an elliptical hollow, probably at least 60 or 70 yards in its longer diameter, and contained two small secondary cones. A considerable amount of vapour escaped steadily from the cone to the right, which appears to be on the site of bocche 2 and 3 (Riccò and Mercali), and also from several fumaroles. Explosions took place from the cone to the left, bocca No. 4, every few minutes. The further or north-west side of the crater was the upper edge of the Sciara, down which such of the ejecta as fell in that direction rolled into the sea.

When I visited the same spot in 1904, intending to take a comparison photograph, I found the crater quite filled up, and the slope of the Sciara continued upwards over its site, so as to form a great ridge right across the foreground of this picture, which concealed the bocca from view. There was a hollow in front of the ridge, but further up the slope than the old crater, and it contained no fumaroles.

PLATE III.

STROMBOLI—THE SCIARA FROM THE NORTH-EAST.

(From 'Volcanic Studies,' Plate XXI., by Tempest Anderson.)

This photograph, taken by the author in 1888 from the ridge overlooking the north-east side of the Sciara, and consequently looking south-west, shows the crater partly concealed from view behind the eastern Torrella, the conspicuous pointed rock to the left, in the distance behind which the western Torrella is just visible. The lip of the crater is just above a large wedge-shaped dyke, which also appears in the next plate. The slope extending down to the right is the Sciara. It reaches from the edge of the crater down to the sea at a slope of about 30°, and its width at the water's edge is about 3000 feet. The edge of the crater has an elevation of about 2400 feet. To the left is a rugged slope, which leads from the left of the Torrella down to the Sciara and the sea, and down which ejecta are thrown during the larger eruptions.

STROMBOLI: THE SCIARA FROM THE NORTH-EAST. 1888.

STROMBOLI: THE SCIARA FROM THE NORTH-EAST. 1904.

PLATE IV.

STROMBOLI—THE SCIARA FROM THE NORTH-EAST.

(From a Photograph by the Author, 1904.)

This photograph was taken on April 20, 1904, from the cliff overlooking the Sciara on the north-east, and thus from the same general direction as the last, but perhaps a little higher up the slope, and, being taken with a longer-focus lens, less of the subject is included. To the right is the slope of the Sciara leading down to the sea, with the cliff behind it corresponding to the one on which we are standing. In the centre is the Torrella, with the slope of the Sciara continued up behind it, and showing the large fumarolic area (bocche 2 and 3). This area was much covered with yellow incrustations, and vapours escaped from innumerable points and cracks. There was one small bocca, from which very feeble explosions took place. They were more frequent than, and quite independent in rhythm from, those taking place from the more western parts. In the background are seen the products of an explosion which has just taken place from a bocca beyond the limits of view, probably No. 4 or 5. In the foreground rather to the right is the same wedge-shaped dyke as in the last plate. Compare the position of the crater in relation to this dyke and the Torrella with that shown in the last plate.

PLATE V.

STROMBOLI—THE CRATER FROM THE WEST.

This photograph was taken by George S. Eunson, of Northampton, on September 19, 1889, during a visit to the Lipari islands along with the Geologists' Association.

It is taken from the end of a projecting ridge to the west of the crater and to the north of the Purtedda di Ginostra (see map and Plate VI., Fig. 1), and consequently in exactly the opposite direction to Plates III. and IV. To the right is the western Torrella, and in the distance behind is the eastern Torrella and the adjacent heights. Between the two is the Apparato Eruttivo, as it is appropriately called by the Italian observers. The bocca which emits smoke in the centre of the picture, and from which the chief explosions take place, appears to be the same as the cone shown at the left of Plate II., but its cone is already beginning to grow a little towards the larger crater which still exists behind and to the right of it. It is probably the same as bocca No. 4 or 5 of Profs. Riccò and Mercali. A small bocca (perhaps No. 3) on the skyline to the left throws out small masses of lava. The Sciara on the left or north side stretches down to the sea, as shown in the previous plates.

Sciara. Bocca 3. Bocca 4. Eastern Heights. Bocca 1. Western Torrella.

STROMBOLI: THE CRATER FROM THE WEST. 1889.

FIG. 1. STROMBOLI FROM THE SEA. 1904.

FIG. 2. THE CRATER FROM THE WEST. 1891.

PLATE VI.

PLATE VI.—Fig. 1.

STROMBOLI FROM THE SEA, 1904.

This photograph, taken by the author from a small steamer, shows the Sciara in the centre and towards the left of the picture extending from the craters down to the sea. Rather below the centre is a rough patch, the remains of a stream of lava, probably one of those of June 24-30, 1891.

The other points of interest can be best identified by the letters.

a. The Filo del Fuoco, otherwise Fila d'a Sciara, the rocky precipice bounding the sciara on the east. Plates III. and IV. were taken from near its upper end. The Semaforo, or signal station, is situated on this slope outside the lower part of the plate.

b. Eastern Torrella, shown more in detail in Plate III.

c. Fumarolic area on site of bocche 2 and 3 (see Plate IV.).

d. Bocche 4 and 5.

e. Western Torrella (see Plates V., VI. (Fig. 2), VII., VIII., IX., X., and XI.).

f. Filo di Baraona, otherwise Fila di Barcuna, the rocky precipice bounding the Sciara on the west.

The plates mentioned in *e* were taken from a point at its summit.

PLATE VI.—Fig. 2.

THE CRATER OF STROMBOLI FROM THE WEST, 1891.

This photograph, kindly placed at my disposal by Prof. Riccò, and taken by Ing. S. Arcidiacono, his assistant, shows the crater of Stromboli from the west on September 3, 1891. It appears to have been taken from the same place as Plate V. To the right is the western Torrella; in the distance to the left the eastern Torrella, with the east cliff bounding the Sciara just showing behind it at the edge of the picture. Between the two Torrelle are more than one eruptive bocca, apparently Nos. 3 and 4. The large inactive crater I is behind the western Torrella. It is noticeable that the whole of this "Apparato Eruttivo" is well below the level of the line joining the two Torrelle, though rising higher than in the earlier photographs.

The slope of the Sciara extends from the crater down to the left of the plate.

PLATE VII.

THE CRATER OF STROMBOLI FROM THE WEST, 1895.

This photograph, placed at my disposal by Prof. Riccò, of Catania, and taken by him on November 21, 1895, apparently from nearly the same point as the last two, shows the condition of the crater above four years later. The western and eastern Torrella occupy corresponding positions to the right and left of the picture respectively. The eruptive area between them shows several bocche, and the slope of the Sciara extends higher than before to the right of the main mouths. The numbers of the bocche are from a figure in a brochure, 'Stato presente dei fenomeni in 1898, Riccò.' The large crater No. 1 is behind the western Torrella.

Bocca 3. Bocca 4. Western Torrella.

STROMBOLI: THE CRATER FROM THE WEST. 1895.

Bocca 3.
Bocca 4 or 5.

W. Torrella.

PLATE VIII.

THE CRATER FROM THE WEST. 1904.

PLATE VIII.

STROMBOLI—THE CRATER FROM THE WEST.

This photograph, taken by the author April 20, 1904, and from the same point as the last, shows the condition eight and a half years later. The western Torrella is conspicuous as before, but the slope of the Sciara now extends far up to the right beyond the active craters, and conceals the eastern Torrella almost entirely from view. It fills up the large old crater No. 1, which was behind the Torrella. The large bocca in the front of the middle distance was that from which all the explosions took place during my visit, and appears to be No. 4 or 5 of Prof. Riccò's numeration. Those beyond it gave issue to vapour only.

PLATES IX., X., AND XI.

These three photographs were all taken by the author on April 20, 1904, from the same point as Plate VIII., but, not being all done with the same lens, differ in the amount of the subject included. They show different stages of several explosions, all from one bocca. The form assumed, like a cauliflower or a bunch of grapes, though usual in volcanic explosions, is not confined to them. It is often assumed by a mixture of heated gases holding fine powder in suspension, issuing from the chimney of a steamer as well as from that of a volcano. Plate XI. in particular shows the volcanic dust dropping out of the cloud of vapour.

STROMBOLI: AN EXPLOSION. EARLY STAGE.

STROMBOLI: AN EXPLOSION. LATER STAGE.

STROMBOLI: AN EXPLOSION, ADVANCED STAGE.

THE MOUNTAINS OF TURKESTAN.*

By ELLSWORTH HUNTINGTON.

The Ontographic Relations of Human Life.

A complete study of geography must consider not only the external habits of plants, animals, and men in relation to their environment, but also human character and methods of thought in so far as they are, directly or indirectly, the product of physiographic conditions. As yet the science of geography is so young that we have grasped but a few of the most elementary of the relations that connect the complex nature of man with his physical environment, and with its indirect effects working through lower forms of life. Indeed, so imperfect is the science that we scarcely know how even to classify the facts belonging to its ontographic half. In the remainder of this paper I shall describe some of the habits and characteristics of the Khirghiz inhabitants of the mountains of Turkestan, and shall attempt to refer them to their physiographic causes. With a certain class of facts, such, for instance, as those relating to diet, this is comparatively easy; with others it is quite impossible. It may be that the high cheek-bones, slit eyes, straight black hair, sparse beards, and small despondent mustaches of the Khirghiz are indirectly due to remote physiographic causes. At present, however, we cannot connect any cause with this effect. Accordingly, the Tartar physiognomy of the Khirghiz must be tentatively pigeon-holed as a fact that may be geographic, but cannot yet be properly classified, and may even, though this is not probable, belong wholly to some other science. In the following pages I shall for the most part omit these doubtful facts that have not yet found a geographic setting, and also, for lack of space, certain others whose physiographic relations are clear. I shall begin with the most important feature of Khirghiz life, the fact that the people are pastoral nomads, and from that shall pass to certain related facts which more or less depend on this main feature.

The Physiographic Conditions of Permanent Nomadism.—The circumstances which favour nomadic life are too well known to need much comment. All races, in their ascent from savagery, may have passed through a nomadic stage, but it is only where the conditions of life are peculiarly favourable that the habit of migrating with their flocks and herds becomes permanently fixed upon a people. The essential conditions are, either that two markedly different climatic zones shall lie so close to one another that it is possible to migrate annually from one to the other, or that in a single region the amount of water or pasture shall be so small that any individual place will support flocks but a few weeks or months at a time. This latter case is that of truly desert countries, such as Arabia, and does not here concern

* Continued from vol. 25, p. 40.

us. In the other case there are two alternatives. In the first alternative, one of the regions is a desert or a mountainous tract where pasture is found during only a certain limited season. The other region is what we call a normal country where permanent agriculture is possible. In such a case nomadism steadily loses ground, because the people more and more devote themselves wholly to agriculture. In the other alternative, one of the regions consists of high mountains that are covered with snow in winter, but furnish fine pasturage in summer, while the second region is one where agriculture is possible, but which is not capable of supporting a growing population, because the climate is either too dry or too cold. Southern Utah, in the basin region of the western United States, furnishes a good example of a country where the lower regions along the edges of the basins are permanently inhabited by an agricultural people in spite of the scarcity of water, while the neighbouring "high plateaus," from 9000 to 10,000 feet above the sea, furnish such good pasture that the inhabitants of the lowlands migrate thither in summer, and have even built rude houses on the uplands. Switzerland, with its chalets, on the other hand, presents an example of nomadism in a country where the lower region is too cool for the highest development of agriculture. In such countries as Utah and Switzerland, the nomadism forced upon the people by physiographic conditions is not necessarily incompatible with a high degree of civilization.

The Nomadism of the Tian Shan.—The nomadism of the Tian Shan is of the same type as that of Switzerland, in spite of the fact that the degree of civilization in the two places is so different. In almost no part of the world is the nomadic life more likely to be permanent than in the region that we are discussing. All the plateau portion of the Tian Shan and much of the Alai region are too cold to allow of cultivation, yet the extent of the uplands and the richness of the summer vegetation enable them to support millions of sheep and cattle. As fall comes on, however, the grass is covered with snow, and the people must take their animals farther and farther down the mountain-side, moving their dwellings as the necessities of the flock require. At last the lowest valley is reached, and the nomad must either stay there through the winter, or risk a journey through the snow over a ridge to another valley. It may happen that his valley is so low and dry as to have no snow during the winter, or that he is on the edge of the mountains, and comes down to the open plains. In that case his manner of life will be the same throughout the year. If, however, the nomad stays in a fairly cool valley, where snow lies for a month or two, he must make some provision for the winter feeding of his animals. In such valleys there is usually a good growth of tall grass during the summer, and this he learns to cut and store in great heaps for use in cold weather. As soon as the process of hay-making becomes habitual, it leads to the repeated use of a single camping site, and

later to the building of permanent houses. The poorer people whose small flocks afford them but a scanty sustenance learn to eke this out by planting hardy grains, and the stage of semi-nomadism begins. The richer people scorn agriculture, and are still pure nomads; the poorer members of the community are perforce half nomadic, half agricultural. In this early stage of semi-nomadism the Khirghiz of the Tian Shan and Alai are to-day. In time they will doubtless come to the true semi-nomadic stage, when, like the mountain Kurds of Turkey, every family has a permanent village habitation, although they spend the summers in tents among the highlands. Further than this they will

THE VALLEY OF KHOJA ISHKEN, AMONG THE ALAI MOUNTAINS. ON THE RIGHT IS A TINY GLACIER.

probably never go, no matter how civilized they become, for, as has already been said, their country is pre-eminently the land of semi-nomadism, and almost forbids any other form of life.

The Khirghiz Nomads.

Domestic Animals.—The preceding generalities prepare the way for a consideration of a few Khirghiz habits and customs which are direct adaptations to a nomadic and pastoral life, and hence may be regarded as ontographic responses to physiographic conditions. The first subject to be considered in this connection is domestic animals, for these are the foundation of all industries and occupations. So pre-eminently is this the case that the word "property" (*mal*) almost always

means live-stock of some sort. The number of kinds of animals is quite limited. Sheep, of a fat-tailed variety, are by far the most common animal, and their milk, flesh, wool, and skin form the indispensable necessities of life. Less numerous and less useful are the oxen and cows, which furnish milk and hides, but are not often eaten. Frequently they are used as baggage animals, and it is no uncommon sight to see a shepherd moving slowly along after his sheep on ox-back. With the oxen must be put the yaks, or "Chinese cattle," as the Khirghiz call them, that are found in small numbers among the nomads whose winter quarters are especially elevated. The milk of yaks, and especially the cream, are delicious. Some of the best of the Khirghiz animals are a cross between yaks and ordinary cattle. Another important animal is the two-humped Bactrian camel, which is kept in part for its milk and hair, but is chiefly valuable as a beast of burden and an article of sale to the people in the neighbouring lowlands. Camels cannot thrive at the higher levels of the Tian Shan plateau, and even at heïghts of 8000 or 10,000 feet they must, even in summer, be covered with funny coats of felt to keep them warm. The animal *par excellence*, the one to which the unmodified appellation "animal" (*haiwan*) is always understood to apply, is the horse. In such high estimation is he held, that never once during three months' travel do I remember to have seen one used as a pack-animal among the truly nomadic Khirghiz. Most of the horses are small stocky animals, tough and wiry, and with easy gaits, especially the numerous pacers. All are well broken and bridle-wise, and have been well treated, so that few are vicious. The only other important animal is the dog, whose function is to guard the encampment even more than the sheep. Domestic fowls are never met with among true nomads, though one sometimes sees an eagle or a falcon kept for hunting. Some of the poorest people own a few goats and donkeys, but these animals are despised. In spite of the preponderant part played by live-stock in the life of the Khirghiz, the varieties of animals with which he is much concerned are limited to the horse, cow, camel, yak, sheep, and dog.

Dwellings.—Inasmuch as the best pasture for the flocks of the Khirghiz is found close below the continually shifting snow-line, the shepherds and their families must often move their dwellings. Other reasons also render this course advisable. It takes but a few weeks to eat up the finest grass close to the tents, and then either the camp must be moved or the flocks driven further. Again, as the animals are brought close to the encampment at night the ground soon becomes very foul, especially during rainy weather, when there is no chance for it to dry. Accordingly, the kibitkas, as the round felt tents are called, are so built as to be not only thick enough to keep out the heavy rain and snow, but also to be easily taken to pieces and portable. Their appearance and mode of construction are more evident

from the accompanying photographs than from any amount of description. No iron is used in them; the latticework, made of strips of wood 1 inch in diameter, is bound together by bits of raw hide stuck through holes, while the poles which support the roof are tied in place with home-made ropes of wool. Large felts cover the outside, the lower part of which is sometimes still further adorned and protected by matting made of reeds a quarter of an inch thick and 4 feet long, tied so as to stand vertically. The whole dwelling is so made as to fold up compactly into pieces which can be carried by camels or oxen.

Migrations.—Few sights retain their novelty longer than the breaking

DOWN THE VALLEY OF THE TENGIS BAI, IN THE ALAI MOUNTAINS SOUTH OF MARGELAN. IN THE CENTRE OF THE PICTURE IS A SART VILLAGE, LYING ON A TERRACE OF GRAVEL. IN THE BACKGROUND ON EITHER SIDE OF THE STREAM THE LEVEL MOUNTAIN-TOPS SHOW THE OLD PENEPLAIN IN WHICH THE MODERN VALLEYS ARE INCISED.

and the making of a Khirghiz camp and the intervening migration, the ontographic centre around which swings the whole life of these mountain nomads. First, in the early morning, there is the bustle and stir of preparation, the taking down of kibitkas, the gathering of flocks and herds, the catching of neighing horses, the loading of oxen and camels, and the confusion of happy children trying to help in the bustle of this gala day. Then there is the winding procession of animals scattered at intervals along the many-trailed path among the smoothly sloping mountains or in the level basins. Last comes the halt, and the setting up of the graceful frames of the kibitkas on a strip of the

smoothest, greenest sod. At the head of the procession, when first I saw a village arriving at its camping-ground, came a drove of sleek horses, fat mares and frisky colts, running, kicking, neighing, squealing. Then, when the horses had been driven to one side, the loaded camels came gravely on, silent while they were moving, but with fearful roaring and grunting when they were made to kneel to have their loads of felts, rugs, poles, and iron pots removed. With them came the women and children on horseback, the rich wife dressed in green silk, and sitting astride of a silk saddle-cloth of red and yellow, the poor wife in brown cotton. Next, after a considerable interval, came the clumsy pack-oxen, not very noisy except when a dog-fight broke out as they came up, and not very interesting except when an ox ran away with a small boy on top of his load, which adventure caused another small boy of three to run excitedly about in a shirt and a pair of big boots so tall that he could not bend his legs. Quieter still were the cows, and the calves which the boys caught by the tails and tied up by the heads. And quietest of all were the thousand or two of sheep which, after the kibitkas were almost up, came far behind with gentle bleating and the rainy patter of many little feet.

Furniture.—Where migrations are so frequent, the furniture, like the houses, must be easy to pack and move. It consists in part of felts and bright rugs made in the kibitkas from the wool of the household flocks. Another item is the thick quilts made of cotton or silk, stuffed with wool, and admirably adapted to a region where the nights are always cool. Under or beside the pile of these which occupies the side of the kibitka during the daytime are several gay boxes covered with fancy leather work and filled with the family treasures. The women take care of the boxes, and carry the keys suspended at their heels by a fancy cord tied to their black braids. On the right side of the kibitka, as one enters, a tall screen of reed matting wound with worsted in bright artistic patterns shelters the cooking-utensils and food, and shuts off a small part of the kibitka for the special work of the women. The only other furniture, unless the pile of saddles be counted, is of an ornamental nature. In rich houses great hangings of silk, fur, and embroidered velvet, the artistic work of the Sarts of the lowlands, are often suspended from the walls.

Utensils.—Among nomads, the utensils, also like the houses and furniture, must be such as can be easily carried on pack-animals without fear of breaking. The commonest receptacle for liquids is a whole sheepskin, scraped and turned inside out. Buckets and flasks are also made of leather. The latter are sometimes 2 feet in diameter, and are of relatively artistic design. A few china bowls of Russian manufacture are used, but most bowls, as well as spoons, are made of wood. Metal is employed for very few utensils, although the most important article for kitchen use is the enormous bowl-shaped caldron of iron in which

the greater part of the food is cooked. Most of the cooking is done over smoky fires of dried dung, the only available fuel in a country where cattle are abundant and trees rare.

Dress.—In dress the Khirghiz find less opportunity for the expression of artistic sense than do their neighbours in warmer regions. Because of the coolness and dampness of the climatic conditions under which the mountain Khirghiz live, the chief garment of both sexes is a long quilted gown of dark-coloured cotton stuff, to which the frequent rains add a deeper hue and greasy shine. Beneath this is usually another long garment of thinner stuff, coloured cotton or, in the case

ART SHEPHERDS ON THE BORDERS OF BUKHARA AT THE WESTERN END OF THE ALAI BASIN. THESE MEN BUY SHEEP AND GOATS FROM THE KHIRGHIZ, AND DRIVE THEM TO THE CITIES OF FERGHANA.

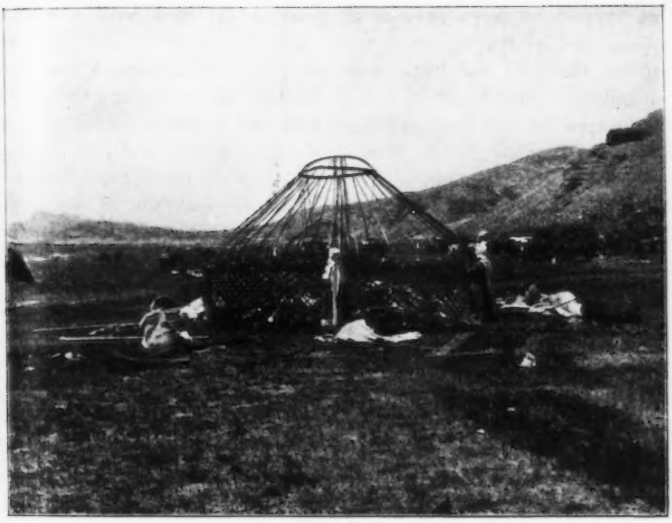
of the richer women, silk, while the under-clothes are made of white cotton. As a rule, both men and women wear big top-boots of raw hide, admirably adapted to resist mud and dirt. The head-dress affords the chief chance for display of artistic taste. The men wear heavy caps of felt, with turned-up brims of the same material or of lamb's wool, and the young girls wear something similar. The married women, however, glory in enormous, strangely twisted head-dresses of cotton, either pure white or delicately embroidered with pale colours. The twisting of these head-gears is an elaborate affair, and varies considerably from place to place, as the accompanying photographs show. Under the snowy head-dress are various ornaments of silver and

embroidery which hang from the hair and fall over the ears and down to the breast.

Art.—Native Khirghiz art, as displayed in the dwellings, furniture, utensils, and dress of the people, is of a distinct type, though primitive. It expresses itself in the rugs, felts, matting, boxes, utensils, and dress already mentioned, and in fringed bands of cotton cloth that surround the kibitkas just below the roof. These are ornamented with designs made crudely by sewing bits of cloth of one colour upon larger pieces of another colour. Pieces of felt with designs of this sort are often used instead of rugs for doors, especially in China, while in the Alai basin the outside of the kibitkas is adorned with little pieces of coloured cloth sewed on to the felt at the base of the roof. The native artistic sense of the Khirghiz finds small opportunity for expression except in articles made of the two great products of the flocks—wool and leather.

Food and Habits of Eating.—As might be expected from their surroundings, the food of the Khirghiz is very limited in variety, and eaten in the rudest way. A typical meal, such as many at which I was a spectator, is likely to prove unpleasant to civilized nerves. One day, for example, I was on the floor in company with a ring of Khirghiz, who sat on the felts which covered all but the middle of the floor of a rich kibitka, when in came a man holding up the skirt of his gown full of dried dung. With this he kindled a pungently smoky fire on the stones which occupied the middle of the kibitka floor, and on the flameless conflagration put some tea to boil. When this was ready, the host took from the latticework of the kibitka a cloth heavy with grease and dirt, and spread it before me. After much discussion, a boy was benevolently sent to fetch me some milk or cream. While he was gone, a metal tray, containing small pieces of bread and sugar, was brought in and laid on the dirty cloth. The bread consisted of cubes, half an inch in diameter, cooked like doughnuts in hot fat at the bottom of an enormous iron bowl. Among the strictest nomads bread is a great rarity, and I have even had the pleasure of giving a piece to children who never tasted it before. After the tray was in place, some china bowls were taken from their nest in a round wooden box, and, having been wiped with another greasy cloth, were filled with tea. By the time this had become cool the boy returned with news that his quest had been successful. At his heels followed a fat Khirghiz housewife, who dived behind the ornamented screen of reeds on the right, and with a wooden ladle scooped almost solid cream from a large wooden bowl into a small china one, and then poured milk from a leather flask into another smaller wooden bowl. As she handed the milk and cream to one of the men, she saw that bread was needed on the tray. Kneeling before a red and green leather-covered box, she reached behind her heels for her silver-loaded bunch of keys, suspended from her long braid

of straight black hair, and, finding the proper key, took from its safe repository a handful of carefully treasured bread. Now the tea-drinking began, and it continued till the supply was exhausted. Each guest had had three or four bowls, but even that was not enough, so each one finished with a wooden bowl of "kumess," the fermented milk that still remains one of the most important articles of Khirghiz diet. Then when the servants had smacked their lips over the remains of the meal, each man, with a look to see that his neighbours were ready, raised his hands to his face, and all in unison stroked their beards, with a muttered benediction to Allah.



THE ERECTION OF A KHIRGHIZ KIBITKA AT A NEW ENCAMPMENT IN THE ALAI MOUNTAINS. THE WORK OF SETTING UP THE KIBITKAS IS ALWAYS DONE BY THE WOMEN.

During the next hour or two big stories of brave deeds and travel were told, or less praiseworthy talk of quarrels and women kept the party animated at first, but soon the kumess took effect, and drowsiness began to prevail. At length, to the relief of all, the host appeared, and we knew that the real meal was at hand, for the tea-drinking is, after all, but a new-fangled Russian notion. In his hand, at the end of a spit, he bore a small piece of roasted fat from the immense kidney-shaped tail of the sheep that we were to eat. Pulling his big knife from his girdle, he cut off a morsel and placed it in the mouth of each guest as an appetizer. Behind the host came his boy, bearing a basin and a copper urn of water, and in the oriental way poured water over the hands of one after another of the squatting circle, beginning, of course, with the

most honourable. As the Khirghiz put out their hands to wash, they made a peculiar gesture of throwing back the sleeves, which are made so long as to completely cover the hands and protect them from cold and wet.

Now all was ready for dinner, and in it came, an enormous quantity of boiled mutton in an enormous wooden bowl, flanked by two smaller wooden bowls full of the broth in which the meat was cooked. The host said, "Eat;" some one else said, "Eat;" and then each cross-legged Khirghiz cried, "Eat," and, whipping his knife from his girdle, seized a bone. The scene that followed was like the feeding of wild animals in a menagerie. Each man grasped a bone, and with his knife and teeth ripped off huge chunks of meat or fat, and with a mighty sucking and smacking drew them into his mouth. The daintiest portions, the head and liver, were offered to the elders of the feast, who skilfully gouged out an eye or yanked out a tongue. When the edge of appetite had been appeased with two or three pounds of meat and a pound or two of fat, most of the guests took a drink of soup, and then, with idly hanging greasy hands and greedy eyes, watched while the epicure cracked and sucked a bone, and one or two of the more skilful carvers prepared a delicate hash. The fat tail, which is really delicious, a selected portion of the liver, and a good supply of other fat and meat were most cleverly sliced into fine fragments and mixed with soup in the bottom of one of the bowls. When the mixture was ready, each man rolled up a handful and sucked it noisily into his widely distended mouth, or, as a mark of respect and affection, put it into the mouth of his neighbour. The meal was over in an incredibly short time—the last bones were cracked and thrown to the edge of the kibitka; bowls of soup, followed by those of kumess, were again passed around; the big top-boots were oiled by rubbing the greasy hands upon them; the beards were stroked; and the main business of life was over. Day after day the diet is the same, except that the amount of meat is less and of kumess more. For variety the mutton is occasionally fried or boiled in its own fat or roasted on a spit. Sometimes, too, a young colt is killed, and is eaten as the greatest of delicacies. The meat, the one time that I ate it, tasted like a cross between the best grades of veal and lamb, and was fit for the table of the most exacting epicure.

Hospitality.—Just as the Khirghiz habits of eating are the result of an environment which compels the people to live on animal food, so the character of their hospitality is the result of that same environment which isolates them, and at the same time compels them to travel. That the Khirghiz are hospitable need hardly be said. Pastoral people are always so. They live in a region where travellers are so few, and habitations so migratory, that special accommodations for wayfarers are out of the question. Yet the nomad himself, in his search for stray

cattle, in his business of exchanging animals, or in his rides between the summer camp and the winter supply of grass, must often spend the night far from home. Everywhere the people are in the habit of receiving guests, and the custom is to pay nothing for entertainment. Because of this the Khirghiz meets the traveller with less suspicion than does the less cosmopolitan villager who lives near a big city. When a stranger arrives, the customary greeting is to take off the cap, shake hands by clasping your host's right hand between both of yours, and lastly to stroke the beard. Often when a stranger passes by, men turn and accompany him on horseback for an hour or two,

A VILLAGE OF THE SEMI-NOMADIC KHIRGHIZ OF THE ALAI BASIN. THE FIELDS, IN WHICH LIE PILES OF GRAIN, ARE PARTIALLY SEPARATED BY WALLS OF MUD AND STONE. ON THE FLAT ROOFS OF THE MUD HOUSES STAND ENORMOUS STACKS OF HAY FOR WINTER USE. IN THE BACKGROUND ARE RIVER TERRACES OF GRAVEL.

to do him honour, and to get the news. The isolated life of the Khirghiz accounts for their eagerness in this latter respect, and the abundant leisure of the nomadic life accounts for the unconcern with which a man puts off his work for half a day. These chance encounters on the road are often most interesting. One day, as I was crossing the Jukuchak glacier south of Issik Kul, five men appeared on the ice above me, one mounted on an ox, one on a cow, and three on horses, with a loaded camel bringing up the rear. All these five strangers dismounted from their slipping animals and, walking across the treacherous ice, gravely shook hands with me. They certainly are a polite and friendly people. Whenever a guest mounts his horse,

the chief man present runs to assist him by seizing him under the shoulder and shoving him up. If the guest happens to be a foreigner who is so peculiar as to wish to have a whole kibitka to himself, a family will often move out, or rather they will let their kibitka be moved away from them. It is a strange sight to see a kibitka picked up bodily by a dozen men and women, who seize the lattice on the inside and, themselves invisible save for the many legs, carry the beetle-shaped tent across the greensward to a new clean spot. The household goods are left in a sorry heap, and the family has to find another house, but even for such service the more aristocratic people refuse to accept pay.

One other hospitable Khirghiz habit is a direct result of the nomadic life and the abundance of animals. On entering the main Tian Shan plateau, I found that each day fresh horses were brought for me and my men, and even for our baggage. At first I understood the servants to say that our horses were tired and needed rest, which was true, but when I offered to pay the hire of the supplementary horses I discovered my mistake. In these regions, it appears, the traveller is theoretically supposed to start from home and to return thither by the way that he went. The first day he rides his own horse, and at night turns it out to feed with those of his host. In the morning he does not take his own animal, but a fresh one from among those of his host. This he again leaves at night, and so on day after day. On the return journey he picks up at each place the horse that he left there and returns it to its owner. In practice the scheme is not so simple. In our case we were furnished daily with from six to ten horses belonging to various people at the camp where we had spent the night. At the end of the day's march, or occasionally in the middle of the day, we gave up the animals to one or two men who had come with us for the purpose of driving them back. For all this the people would take no pay whatever, though it was often offered. So freely does one man make use of another's horses that not infrequently when we passed a new herd, some one would say, "My horse is bad," and would dash off to catch another with a rope looped like a fishing-line to the end of a stick. I do not know how universal the custom is, but during our journey the changing of horses played so important a part that the stock remark was not about the weather, but "How is your 'animal' to-day? Has he a good gait?"

Khirghiz Sports.—The sports as well as labours of the Khirghiz result from the same physiographic conditions which induce nomadism. Horses and horseback riding are the one idea of these people, and their greatest sport is the "bagai." In the Alai valley, close to the border of Bokhara, I saw this interesting game. As we came down the hillside to the smooth plain, a crowd of distant horsemen seemed to be standing motionless, until one or two darted out, and the whole fifty or sixty dashed after them. Evidently they were chasing a leader in some game,

and the leader kept changing. Drawing nearer, we saw that two galloping horsemen had detached themselves from the crowd, and as they rode toward us were struggling for a large black object bigger than a sheep. Suddenly one of them threw his leg over this, gave it a jerk which nearly dismounted his rival, wheeled his horse to the left, and, dashing up to me, threw the thing at my horse's feet. It was a black calf, headless and footless, and partly skinned. At once three or four men who galloped up behind the leader, leaned from their moving horses and attempted to pick it up. Two grasped it, twenty or thirty others surrounded them, and all struggled to seize the calf and carry it

THE BAGAI, OR NATIONAL GAME OF THE KHIRGHIZ. IN THE CENTRE SIT TWO MEN, EACH OF WHOM HAS A LEG THROWN OVER THE ANIMAL FOR WHICH THE PLAYERS ARE STRUGGLING. IN THE BACKGROUND LIES THE TERRACED ALAI BASIN, BOUNDED BY THE LOWER SLOPES OF THE PAMIRS.

off. In the *mêlée*, the horses jumped and turned this way and that, while all the riders tried to force a way to the middle of the fight, whipping their own and other people's horses, grabbing horses by the head and turning them suddenly round, and themselves leaning far out of their saddles as they grabbed madly at the poor black calf. At last one man captured it, threw it over the front of his saddle, put both legs over it and was off at a dead run with fifty others after him. They could not catch him, and, making a great sweep as large as the terrace allowed, he returned in triumph to throw the beast before me and get the customary reward.

Then began another scrimmage, in which one over-zealous rider was

knocked from his horse and apparently trampled on, but when the kicking, surging crowd of horses had passed, his horse was still with him, and he mounted and galloped off with a grin. After half a dozen scrimmages, one daring rider seized the prize and went over the terrace down a hundred-foot slope so steep that a footman could scarcely climb it without zigzagging. At the foot the bold rider, hard pressed by his pursuers, cantered across a broad arm of the river, and away across the plain beyond, trying as he went to skin the calf, for he who carries off the skin wins the "bagai."

We rode away with the "Deyem Bai," the giver of the entertainment, who was homeward bound to inspect the cooking of the sheep for the feast that was to follow. It is the custom, I was told, for men of wealth to furnish a goat or calf for the "bagai," and to invite all the men of one or two villages to join in the sport, and at the end to indulge in a feast, or better, a carnivorous orgie. Among the occasions for a "bagai" are a marriage, the birth of a son, the erection of a new kibitka, and a death. Possibly this struggle for a dead animal is a relic of the time when the ancestors of the Khirghiz really fought to get the prey from one another. Whatever its origin, it is a wonderful training in horsemanship. For some reason, no woman is allowed to see the "bagai," or, naturally, to join in the subsequent feast.

The Nearness of the Khirghiz to Nature.—The completeness with which Khirghiz life and character are determined by natural surroundings, makes the relation between physiography and ontography far more evident than in the case of more highly civilized people. If the nomad is to be successful, the keenest of eyesight is necessary to detect cattle or encampments at a distance. It was with amazement that I heard my guide say, "Do you see those cattle off there at the foot of the mountain? They are Chinese animals—yaks." After a long search I found them, mere tiny specks of black, so far away that even with a strong field-glass I could but barely distinguish them from ordinary cattle. That my guide should recognize them as yaks shows a keenness of sight equal to that of the most skilful hunting tribes of savages. Other Khirghiz showed equal quickness in detecting smoke, kibitkas, men, and animals at a distance, so that the trait seems general.

His mode of life makes the Khirghiz able to endure hunger, thirst, and fatigue, for these are the necessary accompaniments of long rides in search of strayed cattle. He has no fear of raging fords or slippery passes, and despises the city Sart who shrinks from crossing a ford where his horse may lose his footing and be washed downstream. In such rough experiences the Khirghiz learns to be self-reliant, and his frequent meeting of strangers under all sorts of circumstances gives him an air of readiness and self-possession. The talk of the Khirghiz is full of roads and travels. If you ask a man how far it is to a certain place, he at once begins to tell you all the intermediate stages and their

difficulties. These people are full of the knowledge of their plateau that comes from experience, but book knowledge is very rare. As my escort, a proud influential Khirghiz, said one day, "Why should the Khirghiz learn to read? It is enough for us to know about sheep and horses and cattle. What more do we want?"

The Khirghiz and Civilization.—If there were no outside world with which to come in contact, such a view of life might perhaps be wise.

KHIRGHIZ WOMEN IN HOLIDAY ATTIRE STANDING BESIDE A KIBITKA, WHERE THEY ARE ABOUT TO MAKE A VISIT. ALAI MOUNTAINS.

As it is, the Khirghiz cannot stand against the hard realities of civilization. The coming of the Russians has done them an immense amount of good in making the country peaceful and safe, and in providing good markets for the products of the flocks. It has also added to their happiness by making such luxuries as tea, sugar, bread, and cheap cotton cloth accessible to all, but it will harm them if it leads them to abandon the pastoral life for that of the day labourer. The delightfully gentle and gracious courtesy of the Khirghiz cannot offset their laziness, if that term can properly be applied to a quality which

is a necessary outcome of the nomadic life. A nomad is justified in being often idle, for his great exertions at certain times compell him to rest at others, but the qualities so engendered are of no use when steady work is required day after day. Thus it comes to pass that those Khirghiz who have come into close contact with the Russians seem to be deteriorating. Laziness leads to dishonesty, and both tend to insolence and vulgarity. A change of habits, too, leads to greater uncleanliness, for customs that may be harmless where a camp is shifted every month or oftener, lead to filthiness where a kibitka stays for six months or a year in one place. Change is always difficult, and it is especially so for people like the Khirghiz, who have adapted themselves so completely to a type of physiographic conditions so unusual as those of the Tian Shan plateau.

The Position of Women.—Up to this point in our consideration of the ontography of the Turkestan mountains, the connection between life and physiographic environment, though not always direct, has at least been so close as to be clearly evident. We have seen that not only the outward habits of life, but also certain mental and moral qualities are due largely, if not entirely, to physical environment. In the short remainder of this article, I shall take up one or two among the many subjects where such a relation does not at first sight appear, although I am firmly convinced that it exists. In determining the mental and moral character of a people, no factor is more important than the position of women, and the resulting character of the homes in which the children grow up. If the position, and hence the character, of women is materially affected by physiographic environment, it follows that a host of other characteristics must be indirectly affected through the tremendous agency of the home, and of early training. I freely admit that religion, heredity, tradition, and perhaps other unknown factors play an immense part in determining the character of a race, but is it not possible that these, too, in their origin are largely the result of physical environment? With that, however, we are not now concerned. It will be enough, at present, to point out certain ways in which the physiography of the Tian Shan, working through the institutions of nomadic pastoralism, affects the position of women. If our conclusions are correct, all character is influenced, more or less, by physical environment, and hence is one of the integral subjects that go to make up geography.

Mahommedanism, as every one knows, inculcates the seclusion of women, and makes of her nothing but a stupid drudge to do man's work, or a light plaything for his pleasure. Wherever people of Muslim faith gather in towns and cities, as I have seen in Turkey, Persia, Asiatic Russia, and Chinese Turkestan, this ideal prevails. In the crowded villages and cities women can do their work behind high mud walls, and can be confined to certain unseen rooms when male

guests visit the house. The support of the family does not depend upon them, and their activities are almost wholly dependent on the will of their husbands. It is but rarely necessary that they should leave the house, and when they do, there is usually no work to be done and it is easy to keep their faces covered. Only the very poor, who must work out-of-doors, or those who are confessedly immoral, go about with unveiled faces. The evil effect of all this has been often described, and needs no comment.

Among nomads the case is different, and this is true, not only in one Mohammedan country, but, so far as I know, in all without respect to the race of the inhabitants. The women go about unveiled, and have a strong influence in the affairs of the community. Their relative strength of character is evident from the notable fact that when a Turkoman woman is married to a Persian, or a Kurdish woman to a Turk, the wife from the nomad stock, so it is said, usually rules the harem, and often rules the whole house. The universality of the contrast between the position of women in nomadic and non-nomadic Mohammedan populations goes to show that the contrast is not the product of racial differences, but of nomadism; and nomadism, as we have seen, is due to physiographic environment.

Let us see in brief how the nomadic life of the shepherds of Tian Shan affects the Khirghiz women. In the first place, the women cannot be kept in seclusion. The house of a nomad must of necessity be small, and cannot contain two rooms, except under the most exceptional circumstances. When a visitor comes to the tent, he must enter the room where the women are at work, or else the women must work outside, as indeed they must under any circumstances; and there, of course, they cannot be prevented from being seen by men other than those of their families. Then, again, at the time of migrations there are no shelters left standing, and the women cannot possibly be kept concealed. In the second place, the women cannot be made to veil their faces. No one can work with a cloth hanging down over her face. The village woman bakes and brews and washes, and milks her few sheep and goats in the seclusion of her own courtyard, where she can throw off her veil in the assurance that no strange man will see her. The nomad woman, as we have seen, must work in semi-publicity, and cannot be bothered with a troublesome veil, especially when both hands are more than occupied in milking some of her many sheep. Accordingly, while the Khirghiz woman is very particular about her head-dress, she makes no attempt to conceal her face. She is quite in the habit of meeting strangers, whether men or women, and she does it modestly, though without timidity. Indeed, she makes a most admirable hostess. Her freedom from seclusion does much, both morally and mentally, to elevate her above her less fortunate sisters of the villages.

Another side of nomadic life tends to strengthen the character of the women. They are obliged to rely more or less upon themselves, and to take the initiative at times. In their care of the flocks and herds, it often happens that the men are all far away throughout the whole day, and at certain times, when the grass must be cut in the valleys, many of them are away for several days. At such times the women are responsible for everything. I have come to an encampment of seven or eight tents where no one was left, except a few girls and one or two old women. The smaller girls, not unnaturally, were afraid of us; but the newly wedded wife of the chief man, a pretty girl of sixteen, entertained us most graciously, and by the time that her husband and the other men arrived had supper ready for them and us. A veiled village woman would merely have screamed and run away at our approach. Beside all this, the occupation of the men with the horses and larger animals leaves to the women the care of the sheep when the flocks are driven home at evening. And, lastly, it is always the wife who has the responsibility of taking down and packing the kibitka, and setting it up in a new place, while the men take care of the herds. All these differences between the women of Tian Shan and those of the villages are the direct results of nomadism, and all of them tend to make the Khirghiz wife stronger, more capable, and more self-reliant, and hence a better and more loving mother.

In view of all this, is it going too far to say that the relatively free, warm-hearted, and affectionate spirit shown by the Khirghiz in their relation to one another is, in part at least, a geographic fact, the result of the reaction between man and his surroundings? In Karategin, at the eastern corner of Bokhara, I had a most pleasant glimpse into the inside of a Khirghiz family. As we entered the village of Kichik Karamuk, I spied a villager making a rude sledge of the sort which the semi-agricultural Khirghiz use for hauling grain and hay, and which they style "arbas," or carts. Of course I wanted to photograph it, and told my servant Sherif to tell the carpenter to sit out farther into the light. Sherif, for some reason that I did not catch, said that it was impossible, but as another servant put the man in the right place, I took the picture before asking any questions. The sledge-maker proved to be Sherif's brother, whom he had not seen for seven years. Out of sheer politeness the brothers remained silent till the picture was finished, then they embraced one another gently, as wrestlers might clinch before a struggle, first on this side and then on that, repeating very often and very fast the greeting, "Salaamet, salaamet, salaamet" ("Peace to you, peace to you, peace to you"). Later I saw Sherif meet another brother, the oldest out of nine, and an older sister, who had been like a mother to him. The grey-bearded older man, who was some twenty years older than Sherif, literally fell on his brother's neck and wept. The story of the Prodigal Son seemed very real just then. Meanwhile the wet-

eyed sister stood silent till her turn came. As she fell on her brother's neck she wept aloud for a moment, and then, still clinging to him, began to chant a song of thanksgiving; and so she continued for some minutes, first weeping and then singing. Feeling out of place, I went into the kibitka and sat down on the floor. After me came a chubby little urchin of three, with a rosy dirty face and a single scanty garment. A vague idea possessed him that some one had come whom he must welcome, so with a charmingly friendly smile he came and put his fat arms round me.

Conclusion.—This sketch of the mountains of Turkestan, and of the living things that inhabit them, is very far from being complete. To outline the physiography of the region; to describe the old peneplain uplifted into a plateau and warped into basins and ridges; to give an account of the consequent drainage, the glaciers, and the steep-sided young valleys contrasting with the smooth slopes of the old peneplain; and, lastly, to so frame the glacial theory as to fit the old moraines and terraces that everywhere abound,—to do all this is comparatively easy. The way has already been mapped out and made plain, and the subject has a definite classification where each fact finds a place. It is in the newer half of geography, the science of ontography, with its study of the relations between the animate and the inanimate, that the greatest difficulties are met. To thoroughly understand the relations of plants and animals to their geographic surroundings, one needs to be a botanist and zoologist, as well as a physiographer. In the still further reaches of geography, the ontographic relations between man and physiography, the subject becomes at the same time more interesting and more difficult. We possess an immense body of facts, but they are scattered here and there, unmatched and unrelated. We have not even a definitely recognized scheme of classification in which a place can be found for every fact as it appears. I have tried to take some of the chief facts in the life and character of the Khirghiz, and to show how they are related to the physiographic facts of the Tian Shan plateau. Beginning with the grosser, more material aspects of life, it appears that the nomadic pastoralism of the Khirghiz is due to the climate and vegetation of the region that they inhabit. On this are dependent the form of their houses, furniture, utensils, and dress, which in turn lead up to and determine the nature of their art. Again, the food of the Khirghiz is narrowly limited by the nature of their occupations, and this in its turn controls the large body of habits that centre about the necessity of taking nourishment. Another line of thought leads from the frequent movements of the Khirghiz to the character of their hospitality and to their politeness. Once more the plainly ontographic facts of the hardships of the nomadic life result in certain mental and moral traits, such as bravery, hardihood, and, unfortunately, laziness. Lastly, the conditions of nomadic life

determine the position and character of the Khirghiz women, and lead to certain of the higher moral traits, such as morality in the stricter sense, self-reliance, and even family affection. Other equally important subjects, such as government and religion, have been purposely omitted. In every case the attempt has been to proceed from the inanimate facts of physiography to the animate but still purely material facts of ontography, and thence upward by one road or another to the mental, the æsthetic, and the moral. It may be that I shall seem to many to have laid too much stress on the influence of the purely physical, and to have neglected the something, whatever it is, that lies above and beyond the physical. In reply, I can only say that the latter lies beyond the province of geography. I have tried to draw attention to the *relationships* between all that goes to make up the earth and air of the mountains of Turkestan on the one hand, and all that makes up the life of that region, whether it be vegetable, animal, or human, on the other. And as far as those relations have been truly conceived, this paper contains a part of the geography of Turkestan.

SOUTH-WESTERN ABYSSINIA.*

By B. H. JESSEN, Engr. for W. N. McMillan's Expedition, 1904.

In the fall of 1903, Mr. W. N. McMillan, of St. Louis, Mo., U.S.A., organized an expedition which was to go through the Egyptian Sudan towards the districts lying north-west of Lake Rudolf—in other words, the south-western border of Abyssinia.

The object of the expedition was twofold, the main one being to explore as much as possible of the unknown countries lying between the Baro river at Itang and Lake Rudolf, and more especially to ascertain the topography of a mountain plateau called "Boma," lying directly south of the river Akobo in lat. 6° 35′ N., and long. 34° 30′ E. The secondary object was hunting, and, whenever possible, to collect birds and butterflies for the British Museum.

Without going into details, I will only say that the expedition members, consisting of eleven Europeans, thirty-two Somalies and Sudanese, and one Egyptian, were collected in Khartum in the middle of January, 1904, where two steam-launches, an oil-launch, and two big punts were waiting for them. A Sudan Government steamer towed the whole flotilla up the White Nile to the mouth of the Sobat river, then up the Sobat to Nasser, a total distance of 712 miles from Khartum. At Nasser the Government steamer returned, and the expedition proceeded in their own boats up the Sobat and Baro rivers as far as Gambela, in Abyssinia.

As these rivers have been thoroughly described by previous travellers, I will but say that, as at the time of the year when we went up

* Map, p. 244.

(February and March) the water in the rivers was low and it was generally admitted that navigation was impossible, it may be interesting to learn that, with the exception of the ordinary difficulties met with in low-river navigation, and lack of fuel, we found no difficulty in getting as far as Gambela, the furthest point ever reached on this river, even at high flood.

The draft of our deepest-going boat was 30 inches. On April 27, the expedition proper started overland south from a place called Pokum,

A BOMA GIRL SELLING MAIZE FOR MEAT.

on the Baro river, some 10 miles east of Itang—a Sudan military post in Abyssinian territory. As the first 50 miles of the country traversed have been previously described by the late Italian Captain Bòttego, I will omit it here, and will only add that all of the country lying between the Baro and Akobo rivers is at present considered Abyssinian territory. After three days' march, however, through flat well-wooded country, following Captain Bòttego's route, we came to a river called Gelo, about which I will make a few remarks, as a statement made by Bòttego regarding a point on it was found to be incorrect.

On all maps of this district, the river Gelo is shown to run through a small lake called Tata. On making a rough survey of the river, I found that the lake is an overflow lake from the river Gelo, which runs half a mile south of it, as shown on the maps attached hereto.

From this point on, we started to go through unsurveyed country, going up the course of the Gelo river eastwards, towards the Abyssinian highlands for about 20 miles, and then south to the Akobo river. The country was of a gently rolling nature, well wooded and covered with grass, which in places became almost impenetrable. Along the river we met with swamps or large plains with coarse grass from 10 to 12 feet high, impossible to go through at that time of the year (May). However, we followed a native path going from village to village, and on the whole found little difficulty in making from 2½ to 3 miles per hour.

With regard to the forests, they were, as a rule, of a park-like appearance, and with the exception of groves along the river-bank, the trees seldom attained a greater height than 50 feet in this particular district. Along the river, however, some of the trees assumed an enormous height and girth, and the vegetation was of a dense tropical nature, creepers and palms of many varieties giving the landscape a most beautiful appearance. The river itself was the most tortuous I have ever seen, in many places doubling upon itself in such a manner that one could throw a stone over the narrow slip of land which divided one part of it from the other. In the rainy season parts of the surrounding land becomes inundated, and although the river-bed showed no sign of having undergone any recent change, it undoubtedly undergoes many quite marked ones, which, on account of the deep soft soil and the luxuriant tropical growth, becomes completely obliterated in the course of a single season.

The Gelo river has its source among the southern Abyssinian mountains, and runs to the north of the mountainous district of Gurafarda, where it descends to the lowlands, and then winding its course westward until it joins the Pibor river, which is a tributary of the river Sobat. Its total length is about 200 miles, and as it is the main watercourse in these districts, it is of some importance. In flood it assumes quite large proportions, being from 80 to 100 yards wide in places, with a depth of about 20 feet. The river abounds with fish, and as a natural consequence the crocodiles are very numerous and large. At midday practically every sandbank is covered with them. It is a remarkable fact that the hippopotami are conspicuous by their absence, only one having been seen and killed many years ago, as these animals are plentiful everywhere else in these countries.

The forests in the immediate neighbourhood of the river teem with animal life. Elephants, giraffes, buffaloes, various antelopes and gazelles, wort-hog, wild pigs, lions, leopards, hyenas, jackals, wild cats, monkeys, etc., may be met with at any time. The elephants assume an

enormous size, one which a member of our party succeeded in killing having tusks weighing 110 and 108 lbs. respectively.

The bird life was not so prolific as might be expected; very few waterfowl or cranes were seen along the river, and in the forests paraquets, pigeons, doves, some quail and partridges, vultures, hawks, and some beautifully coloured small birds, were all we saw. The country swarms with insects, especially ants of every possible kind.

PARK LAND.

Regarding the inhabitants of these regions, they belong to the Anuak tribe of people, about whom I believe something has been written before by the emissaries of the Sudan Government. On a trip like ours, where short stays only were made at any place, it could not be expected that any thorough knowledge of the people could be gained, so much the more so as until our arrival they were unacquainted with Europeans. On the whole, they were a healthy-looking race, the men nearly all being 6 feet in height, of a slender muscular build, with features of a refined negro type, the thick lips and flat nose being the exception

rather than the rule. But it seemed to be the custom for the men to have the front teeth in their lower jaw extracted. After gaining their confidence through presents and letting them understand that we were peacefully inclined, they would gather together about our camp, squat down and talk and laugh like children until sundown, when they all would go back to their villages, and would not return again until sunrise the next morning.

They were very fond of bright ornaments, such as brass, tin, iron, and ivory. Some of the men had their arms covered with brass rings from the wrist to the elbow, and a huge ivory armlet around the upper arm, making them perfectly useless for any kind of work.

It was an amusing sight, after we had been a few days in camp, to find some boys with the lids of sardine or biscuit tins tied around their necks, or a sardine-tin opener stuck through their ears, while the women would gather up the used soda sparklets and make necklaces of them.

With regard to their religion, they are utterly heathen, having only the faintest idea of a Supreme Being, and at the same time being in dread of evil spirits, which they believe to be prowling about at night.

The nearest mission station to these people seems to be an American one, about 250 miles westward on the Sobat river, and as this mission evidently have their hands full with a tribe of people called Nuers, the Anuaks are still utterly ignorant of our religious beliefs. They are pliable, however, and I believe could be easily taught.

With regard to their government, they are all supposed to be under some Abyssinian "Ras," to whom they must pay a yearly tribute, either in ivory, labour, or grain. Directly they are ruled by their own chiefs, or "shaums," whose power is absolute; when a chief dies, his son becomes chief in his place, thus proving the power invested in them to be hereditary. Each chief has his sub-chiefs ruling over outlying villages and districts, who must pay some yearly tribute to the head chief.

All the members of a tribe are not equally well off, there being rich men and poor, just as in a civilized community, the rich men being invariably the headmen or supporters of the chiefs. We noticed cases where some men would come to us and beg for something to eat, while the well-to-do men in the tribe would have hundreds of sheep grazing around. It seems, then, that they have a strict system of government, and that personal property is respected among them. This may, of course, easily be accounted for when we consider their close proximity to Abyssinia and the Sudan.

There is no doubt that these people, who, sad to say, are gradually becoming extinct, are greatly influenced by their surroundings and the peculiar circumstances in which they are placed. Shut in on one side by the giant Abyssinian mountains, and on the other by the warlike and ever-aggressive Nuer tribes, their existence is not much better than that

of the flying fish. The Abyssinians, though officially their protectors, make yearly raids on them, ostensibly to collect their tributes, but incidentally taking away boys or women for slaves. This, however, may not be officially known by King Menelik. The Nuers on the other side make inroads on their land, in order to gain larger pasture-grounds for their cattle. Being a peaceful people, almost entirely agricultural in their habits, and only having rude spears for protection, they are

VIEW NORTH FROM BOMA.

almost invariably subdued, and consequently it will only be a matter of a few years before the whole tribe will be swallowed up and divided among the Abyssinians and the Nuers.

Their chief industry, as before mentioned, is agriculture, comparatively few cattle, sheep, or goats being raised, evidently because of the great death rate caused among all domestic animals by a certain kind of fly. On the expedition we had with us 220 mules, ponies, and donkeys, of which only about 60 came back alive after a three months' trip through this country. Chickens seemed plentiful, but they were of a small inferior kind.

The Anuaks are not very numerous. As to their number, I would not like to give any definite figure. They almost invariably have their villages alongside some watercourse. Their huts are built of wood framework covered with straw, and consist of one room only. They are not very cleanly, as they have a great liking for smearing themselves with fat or castor oil. This latter plant can be seen growing round every village. Their staple food is maize or durra, and as the soil is excellent, the crops are magnificent, and are raised with a minimum of labour. The whole tribe, men and women, assist in working the fields, and in order to protect the crops against the ravages of swarms of small birds, which come round just before harvest time, they erect look-out towers, on which the women and children are posted with a plentiful supply of mud, which they throw by means of long supple sticks into the cornfields, shouting at the same time to frighten the small marauders away—surely an arduous task in such a hot sun. They have many other kinds of scarecrows, but the above seems to be the one most in use. The corn is ground in the most primitive manner, between two stones, and is, of course, assigned to the women. Of vegetables, they have a kind of pumpkin, a large overgrown cucumber, some wild yams, beans, and a plant which looks like a four-leaf clover with a yellow flower, the name of which I did not get. Of fruit trees they have none, except the doleb and dom palms and a very few date palms.

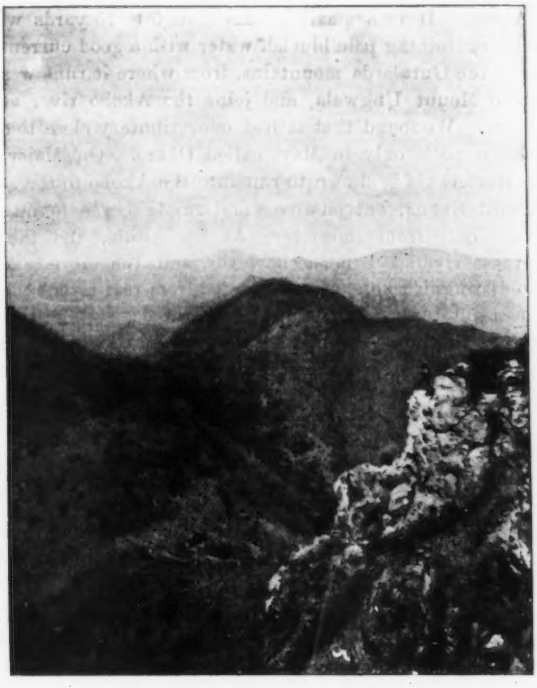
The land is cultivated only sufficiently for their own consumption. In bad years, or when raiding parties have been around, they very often have to live on wild roots or whatever they can manage to trap. Although the woods are full of game, they do not seem to know much about catching any, and they were highly gratified when we killed something for them. I saw some rude trapping implements, but they seemed to have been in long disuse. As a rule, no clothing is used by the men, and only a small piece of dried skin by the married women. Boys and girls go about in nature's garb.

As to their language, I can say little about it, not knowing enough Arabic, Nuer, Galla, or Abyssinian—the neighbouring languages—to make a comparison; but they evidently speak a language of their own, as none of our men could understand a word of what they said in the beginning.

Along the Gelo river these people are ruled over by a sheik called Shama, residing in a village by the name of Gog. The tribe was here fairly numerous and very friendly. When we asked for porters to carry some of our boxes, we secured 382 men without any trouble from Sheik Shama. These porters carried our things for four days to the Akobo river, a distance of about 40 miles, whereupon they returned to their villages. They were paid in beads, brass wire, calico, or Maria Theresa dollars, the only coin which they seemed to understand, this being the current coin of Abyssinia. Polygamy is practised everywhere,

and their mode of marriage seemed to consist in exchanging a woman for money, beads, wire, or, wherever possible, cattle.

The climate, though warm, was not unbearable, the thermometer seldom exceeding 100° in the shade after leaving the Baro river. When going through the country between the Baro and Akobo rivers in May, we had only a few rain-showers, and consequently the going was excellent, in spite of the flat nature of the land. On returning in June, however, the whole aspect of things had changed, heavy showers



VIEW FROM TOP OF CENTRAL PEAK.

having practically inundated the country for miles around, and at times we had to ride through water reaching to the waist, while the clayey nature of the soil would make the going exceedingly heavy.

As the attached maps will show, we crossed several new water-courses between the Gelo and Akobo, none of which, however, were large. The river Agogotok, which was the largest, is undoubtedly the river Owag, marked on Major Austin's map, but it seems to have its source among the swamps and lowlands around the district we traversed rather than in the Abyssinian mountains, as at the place we crossed it in May

it had hardly any current, and was surrounded by swamps and pools. No habitations of a permanent character were found in this district, only a fairly good path leading from the Gelo to the Akobo rivers.

With regard to the Akobo river, it has been described by Major Austin, as far as its junction with the Ajuba river, and from there on, almost to its source, by the late Captain Bòttego.

Where we camped near the Akobo river in May, we made a few discoveries which will change the present maps somewhat. In the first place, the river which Captain Bòttego calls Chiarini, is called by the natives Akula. It is a small stream from 5 to 15 yards wide, with steep banks, containing pale blueish water with a good current. It has its source in the Gurafarda mountains, from where it runs westward to the north of Mount Ungwala, and joins the Akobo river at a place called Digira. We found that it had one tributary close to our camp, with water in pools only in May, called Ogero. On Major Austin's map, the river Akula is shown to run into the Akobo to the south of a village called Kenna, but on investigation, this was found to be an overflow kor only from the rivers Akobo, Akula, and the swamps between these rivers. I must, however, add that it is exceedingly difficult to distinguish kors, overflows, etc., from real river-beds in these districts, as the rainy season, on account of the flat state of the country, plays havoc with the soil generally, and at times forms channels from river to river which are very misleading. The country to the south of the Akobo river is flat, and although covered with open woods, it is swampy, and, according to native information, almost inundated in the rainy season. A few miles east of Mount Ungwala, Mr. McMillan found a small lake, between Lakes Garner and Bright, named by Major Austin, which we called Lake Lucie. The village of Digira, which lies on a point formed between the rivers Akobo and Akula, and most of the country eastward along the Akobo river as far as its junction with the Ajuba, seemed to be under the rule of Sheik Olimi. This man is the son of the sheik who was supposed to have been killed by Captain Bòttego's men some years ago, and for that reason he was at first chary about letting us have any of his men. However, we succeeded in getting some, but found that he really did not have many men, the Abyssinians having been in the district within the last two months on a punitive expedition.

From the junction between the Akobo and Ajuba rivers, the Akobo comes from an easterly direction, and as Captain Bòttego went on the south side of the river, and we on the north, we again went through practically unsurveyed country, where we found a few villages and watercourses not seen before. The country now began to assume a mountainous character, and while the vegetation remained about the same the population thinned out quickly as we approached nearer the Abyssinian mountains.

The last village which we saw was called Olam, and as a raiding party from the east had gone through this district recently, we only found a few old men in the village. They told us that there were two more villages further east, and that the people living in them were called Olamis, but that they spoke the Yambo language. From this point on we struck south, crossing the Akobo river, which was still a good stream from 30 to 80 yards wide, with swift-flowing water about 3 to 10 feet deep in places. We now entered upon wholly unsurveyed country, one

CASTLE ROCK, BOMA.

of our objects being to find out the source of a tributary of the Akobo, called Kaia (see map, p. 244). The country in front of us was at first excellent undulating grass land with open woods, and here and there a hill or mountain. Contrary to the assertions made by the natives to the north of the Akobo, we found lots of game everywhere, the giraffe being especially plentiful. As we advanced, the mountains became more numerous, and the ground, which at first was composed of good soft soil, became strewn with stones and boulders of every size. As the grass was long, and there being, of course, no path, we had

great difficulty in getting our pack-animals through, and I may add that it was only owing to our animals being specially picked mules and donkeys that we were able to get along at all. A camel caravan would inevitably become stranded among these mountains. We struggled on southwards for five days, when we reached a large mountain plateau on the north side of a peak, which we called Central peak, owing to its position on our map. All along we had either been following the Kaia river or been within sight of it. We found it to be a small stream with well-defined banks, containing little water only in June, but it showed evidence of assuming quite large proportions in the rainy season. It may be assumed that it has running water the whole year round, and for that reason it would be of value should any party choose to take this road down towards Lake Rudolf. It has its source partly from Central peak and partly from the mountains to the east, from which the river Sacchi flows south into Lake Rudolf, and thus water can be had all along the route. The plateau north of Central peak, lying as it did 3800 feet above the sea, was a most delightful spot, the climate being excellent, with a temperature during our stay ranging between 60° and 85°. The plain itself (which we called Zebra plain, extending over about 150 square miles) was covered with a luxuriant growth of fine grass, which was about waist-deep at that time of the year (June). Mimosas, acacias, and different varieties of small well-rounded trees were scattered all over, while grass-clad hills and rocky protuberances lent a charm to the scenery which was irresistible. To the south, Central peak reared its head 5200 feet above the sea, clothed with pale-green grass to the very top. Game was so plentiful that wherever we went we met with herds of giraffe, Jackson hartebeest and zebra, and some ostrich. In the middle of the plain the enormous white skull of an elephant was lying like a monument, thus proving that these monarchs of the forests have paid this marvellous spot a visit many years ago. A more beautiful place for sport, or as a health resort, could hardly be imagined.

We ascended Central peak, and had a most wonderful view of the whole country for many miles around. To the south-east, about 40 miles distant, Mount Naita reared its sharp-peaked head some 7300 feet into the sky. Between it and us a broken and almost impassable mountain plateau lay before us. This continued to the east as far as we could see, and to the west as far as Boma. Thus we saw at one view the whole of the country enclosed between the routes taken by Major Austin to the west and Captain Bòttego to the east, and decided to go no further.

The whole of this country is volcanic, and almost entirely uninhabited. We found a few huts among a clump of trees, which had been long deserted, and only once did we have a visit from a couple of poor half-starved looking blacks. One of these had a most murderous-looking

weapon round his wrist, consisting of an iron bracelet bent out and formed into an arrow-point underneath. They wore no clothes, and spoke a language which we could not understand. They pointed towards the north, indicating where their village was, and as we saw smoke ascending from among the mountains in that direction, we concluded there was a small tribe living there. Further east, at the foot of the mountains from which the rivers Sacchi and Kaia flow, there are, according to Bòttego, several villages, and the land is partly cultivated.

We went a few miles south of Central peak, but found the country so completely torn up that, on account of our pack-animals, we decided to strike about north-west towards Boma. After a day's journey, during which both men and animals suffered severe hardships on account of the rough ground, we got out on a rolling mountain plateau covered with scattered trees and grass, and with more even ground than we had had for many days. In places we came across large fig-bearing rubber trees and some dom and date palms among patches of ground which showed evidences of having been cultivated years ago. No signs of any huts were found, however. After four days' marching, we came to a district well populated and highly cultivated, which the natives called Boma. Major Austin went through this country some years ago, but did not succeed in getting into close contact with the natives. In this respect we were more fortunate, as, after proving to them that our intentions were peaceful and friendly, they very quickly got over their fear and gathered around our camp, which we made on the top of a rocky spur running into the mountain ranges to the south. The country itself was of a most peculiar character, and the scenery was very beautiful. The rock formations were very curious and imposing, some huge rocks rising vertically out of the plain to a height of several hundred feet. To the south, a range of mountains 5000 to 6000 feet high formed a kind of half-circle around the plateau over which we had been travelling. Far to the east Central peak was plainly visible, and to the north the dark and imposing Abyssinian mountains loomed up in the grey distance. To the west and right round us, fantastic jagged rocks and hills gave us a broken view of apparently endless plains covered with forests, which would open up and show us glimpses of green fields in places. Down among the hills and around the huge granite rocks these strange people had their villages and plantations. Some villages were nestling on green spots high up among the mountains like birds' nests, while others would only give us an indication of their existence by little ribbons of smoke curling lazily up into the blue sky from the forests. Numerous valleys and watercourses gave variety and a peculiar character to the scenery, while the park-like appearance of the woods, the absence of flies, and the fresh cool air made the place a perfect paradise.

The people living in this mountain fastness were strong, tall, and handsome, and seemed to be a much superior race to the Yamboes. They

were fearless and most decided in their manners, though suspicious of any sign of hostility. Most of the men wore a piece of skin in front of them from some wild animal or another, loosely slung by a piece of string over one shoulder. They must be good hunters, as they had skins of giraffe, zebra, and various kinds of antelope. They seemed to have no domestic animals, except goats, and lived chiefly on agriculture. Better durra or cornfields I have never seen anywhere, and they seemed to cultivate every available spot. Villages and cultivated fields were hidden away in the most romantic spots among the corners and cracks of the mountains. The condition of the crops was bountiful in the extreme, and where they could find people enough to consume such quantities of grain was a mystery. However, in trying to secure a guide in a lonely spot near a small durra-field with only one hut visible, we were astonished to find ourselves confronted with a score of handsome-looking warriors, all fully armed, appearing in a moment as if risen from the ground. We had evidently been watched and followed the whole way, and apparently had a lot to learn about the mysterious ways and means of the people of Boma. They were armed with two kinds of spears—a long one and a short one—and some of them had the same murderous wrist weapon which we had seen on a native at Central peak. As to their language, we learned some fifty words of it. It seemed to be peculiarly their own, and did not resemble the Yambo, Galla, or Abyssinian. They can only count to ten, and only a few of them were able to give me their names on that many figures. They are fond of ornaments, and wear a broad band of red beads, with a white stripe down the centre around their forehead, giving them a peculiar warlike appearance. Some of them appeared at the camp in all their war-finery, painted and feathered, and looking like demons, but never at any time did they prove unfriendly to us. They seemed to have a sort of stronghold on top of a mountain, 4000 feet high, to the south of us, as they stopped the writer when attempting to go up to the top in order to get some bearings. I took some photographs of these people, from which one gets a good idea of them. I believe these were the first and only pictures taken of this tribe. As to their number, government, religion, etc., I am unable to say anything, as we did not stay among them more than a couple of days: the food-supply for our men was running short. We bought maize enough from them for four days' rations, but after that they refused to sell us any more, as we could not give them salt, the only thing they seemed to want. The Abyssinian influence does not seem to extend to these regions as yet.

Among these hills several rivers have their source, such as the Ajuba, Chilimun, Neubari, and probably the Pibor. This latter, however, is to be investigated next year, and I may add that at present I am taking a course of instruction from the Society's instructor, in order to perfect myself for this work.

With regard to the Ajuba river, we found a small discrepancy between Major Austin's map and our own. The Neubari has a branch which starts from a point among these hills, which Major Austin has marked down as practically the starting-point of the Ajuba river. The mistake is unimportant, however, as both rivers are small and of no consequence. The Ajuba river is nothing more than a mud ditch, having water in pools only in June. Elephants and other game are plentiful on the west bank.

The next part of our journey was to the north, on the western side of the Ajuba river, and as Major Austin went south on the eastern side of the same river some years ago and gave a very good description of the whole country, there is little more to be said about it, as we did not find any habitations from the time we left Boma until we reached the Akobo river again. This journey took us four days, and went through rolling grass and wood-covered country along a row of hills skirting the Ajuba and Akobo rivers. The country was everywhere of a volcanic nature. Here and there we would find a pile of granite rocks piled up in artistic disorder, but as a rule all the rocks were lava. The soil was splendid, and around Boma I have no doubt that both coffee and tea could be grown, only the place is so far away from any market at present that it would be useless for settlers. An inferior kind of tobacco is grown everywhere, which the natives crush, dry, and mix with ashes and other ingredients, whereupon it is made into the shape of a sugar-loaf. Cotton was seen growing wild in places, and there is no doubt that by cultivation it might be made a paying industry. On the whole, however, the erratic climate does not seem to offer any good inducements for any one to try and develop this particular part of the Sudan or Abyssinia. As the observations made by this expedition unfortunately were very limited, it is possible that closer investigations will show riches of soil and minerals which our casual survey overlooked.

To conclude, taking a general view of the whole of the country which we traversed, I will say, that with regard to a commercial waterway or connection between Abyssinia and the Sudan, the Baro and Sobat rivers seem to be by far the most promising, as they are navigable in specially built boats the whole year round, as far as Gambela, a small place lying at the western foot of the Abyssinian highlands, and only some 30 miles from Gore in Abyssinia, a town which seems to be the main western trading centre in that country. The country around Gore is excellent, both for agriculture and cattle raising.

If the Sudan military post at Itang could be removed to Gambela, it would no doubt be the foundation of a very profitable trade between the two countries, Itang being too far removed, and the road to it from Gore too difficult, to induce the Abyssinians to undertake the journey.

NOTES ON AN IRISH LAKE DISTRICT.

By O. J. R. HOWARTH.

In September of 1904 I intended, while travelling in Connemara and the south of the county Mayo, to make soundings in certain of the small loughs west of Lough Corrib and Lough Mask. Owing mainly to the prevalence of high winds, I was unable to carry out my programme fully, but I have thought my few observations might be recorded in view of any future organized work in this district.

My soundings were made along sections between defined points, and have been plotted on the 6-inch Ordnance map. I went prepared to sound, photograph, and compile notes on the structure of the lake-basins. My sounding-lines were similar to those used by Dr. Mill and Mr. Heawood in the English Lake District, and the lead weighed 4½ lbs. I had covered it with a netting of tarred cord, with a view of minimizing the risk of damaging the paint of boats; this had the unanticipated result that the lead nearly always came up coated with the sediment of the bottom.

For the purpose of the few general notes which follow, the northern, southern, and western boundaries of my district may be taken respectively as Clew bay, Galway bay, and the coast between these inlets. This is perhaps the most striking portion of the western lake region of Ireland. From the south shore of Clew bay rises the isolated quartzite cone of Croagh Patrick, 2510 feet in height. A gently undulating area of bog, with a few small loughs, extends south from it to the Mweelrea and Sheefry groups. These are of various Silurian rocks, and separated by the Bundorragha river, draining Loughs Cunnel, Glencullin, Dhulough, and Finn, south to the Killary harbour, a fine hill-bound inlet of the Atlantic. Evidence of glacial work is abundant in the moraines along the Killary and in the striated rocks about Dhulough. South again the bogs reappear, and then from their midst the Twelve Pins or Bens rise sharply like an island, bold quartzite hills reaching 2556 feet of altitude. A chain of considerable loughs, Inagh, Derryclare, and Ballynahinch, winds about their base on the east and south; westward they sink more gently to the sea. The eye travels south from them towards Galway bay over a remarkable boggy tract sown with small loughs, the connections of which are largely below the surface. A few low hills appear towards the bay. East of the Pins (the bog intervening) the quartzite Maamturks and Corkogemores extend towards Lough Corrib, and east of the Killary are the table-topped Partry mountains and other hills extending to Lough Mask.

The lakes of this district seem to fall into two broad divisions, which may be called bog-loughs and mountain-loughs. The first class, of which the largest examples are the Inagh-Ballynahinch chain, are

irregular of outline, studded with islands when of any great extent, and obviously shallow, with flat or gently sloping shores. In this class a subdivision must be made, for the lakes of which the Ballynahinch chain are examples really occupy the boggy bottoms of broad valleys between hills, while the innumerable little loughs in the south-west of the country are merely pools in the plain bog occupying no defined valleys. The only examples of mountain-loughs exceeding a mile in length are Dhulough, Nafooey, Fee, and Kylemore. Of these, Dhulough I have already located; Nafooey lies among the hills east of the Killary; Fee is rather over a mile south of the Killary, and Kylemore lies south-west of this, between the Pins and Leamnahaltia mountain. Islands (other than mere rocks), where occurring in all the loughs, are thickly covered with stunted trees and shrubs, and the same is true in a modified degree of a peninsula on the north shore of Lough Fee and two on the south shore of Nafooey; whereas wood is almost wholly wanting elsewhere in this district, except in rare artificial plantations. My soundings are confined to Dhulough, Glencullin, and Nafooey.

Dhulough, which lies north-west and south-east, is 1 mile 1470 yards in length. It is oblong, and its extreme breadth of 800 yards is found in the upper part, but two-thirds of the distance down it narrows to 800 feet by the incidence of two rocky points opposite one another. East and west the hills fall sharply into it, the slope easing very slightly, and there is no beach except in one or two small bays. At the upper end there are beaches of very small rock fragments, and a short stream falls in from Lough Glencullin, about 230 yards distant in a straight line. The surface levels by the Ordnance map, from calculations in November, 1896, are, of Dhulough 108·5 feet, and of Glencullin 128·2 feet, but a former calculation made the latter figure 136. I was told that the level varied greatly. I dare say the eastern flank of Mweelrea is exceptionally rainy, as the mountain directly faces the sea, and from the midst of a storm at Dhulough, with a westerly wind, I often saw clear sky to the north.

At the lower end of Dhulough the shore is low, for the Bundorragha river flows out and the Glenummera enters from a valley between the Sheefry mountains and Ben Creggan. The beach here is sandy. On the east side the shore-line is partly artificial, being built up to carry a road. Besides the streams mentioned, a minor one enters the lough at the north-west corner from the fine cliff-bound glen under Ben Lugmore, where a bog obviously occupies the bed of a drained tarn; and several fall in from the Sheefry, which has many springs. In the north-eastern angle is an island, which is omitted in the 1901 revision of the 6-inch Ordnance map.

The name Dhulough signifies black lake, and from the hills the water has a curiously dark appearance. As in all these loughs, it is not

clear, and bubbles brown under the oar. There is very little vegetation in the lough. The bottom I found to consist of a dark-brown grit or disintegrated peaty matter, with one notable exception, for at the sounding of 121 feet on the west side towards the middle the lead brought up a fine bright yellow slime. The line of greatest depths, indicated by the broken line on the map (Fig. I.), appears to swing regularly towards the steeper shore. The sections (Fig. II.) reveal a continuation of the sharp slope of the hills, with a tendency, best marked at the southern end, to an almost flat floor at depths about 100 feet. The deepest soundings (164 and 150 feet) fell naturally about the middle of the upper and wider part of the lough. No considerable shallow bank was observed except at the north-western corner, where one is formed, I think, by the deposits of the torrent from Ben Lugmore. The two main streams entering the lough, namely, that from Glencullin and the Glenummera, form no deltas or shallows. The Glencullin stream is cleared by its course through that lough, while the Glenummera comes down through a flat-floored valley, and enters Dhulough by a deep quiet channel several hundred yards in length. There are, it is true, slight banks of sand to right and left of its mouth, but the first sounding marked from the point A (Fig. I.) outward was 61 feet.

Lough Glencullin lies west-north-west and east-south-east, is about 1340 yards in length, and nearly 600 yards in extreme width. It differs greatly from Dhulough; in fact, here, I think, the two types of bog-lough and mountain-lough exist side by side. The form is irregular, two considerable bays occurring at the lower end. The main stream enters at the top through a deep and tortuous channel, having descended from Lough Cullen in a series of cascades. An offshoot of the stream from the glen under Ben Lugmore runs into the southern bay. There are two islands in the lough, and a considerable bed of tall reeds at the upper end. The shores are either boggy or rocky, but a slight beach of small fragments occurs at the upper end. Although my soundings were made only on two sections in the upper part, I see no reason to suppose, from the general appearance of the lough, that any depth greatly exceeding my deepest sounding of 27 feet would be found elsewhere.

Lough Nafooey lies almost exactly west and east at an elevation by the ordnance survey of 93·7 feet. It is about 100 feet over 2½ miles in length, and about 50 feet over half a mile in extreme width. Abrupt flat-topped hills flank the straight valley of which it occupies part to north and south, reaching 1800 to 2000 feet on the north, and 1500 to 1900 feet on the south. The lough is oblong and rather regular in form, except that the southern shore is broken in the lower and wider half by one considerable peninsula, with a rocky island off it, and by one smaller one (at the point C in the diagram, this projection being a slight elevation almost insulated by marshy ground).

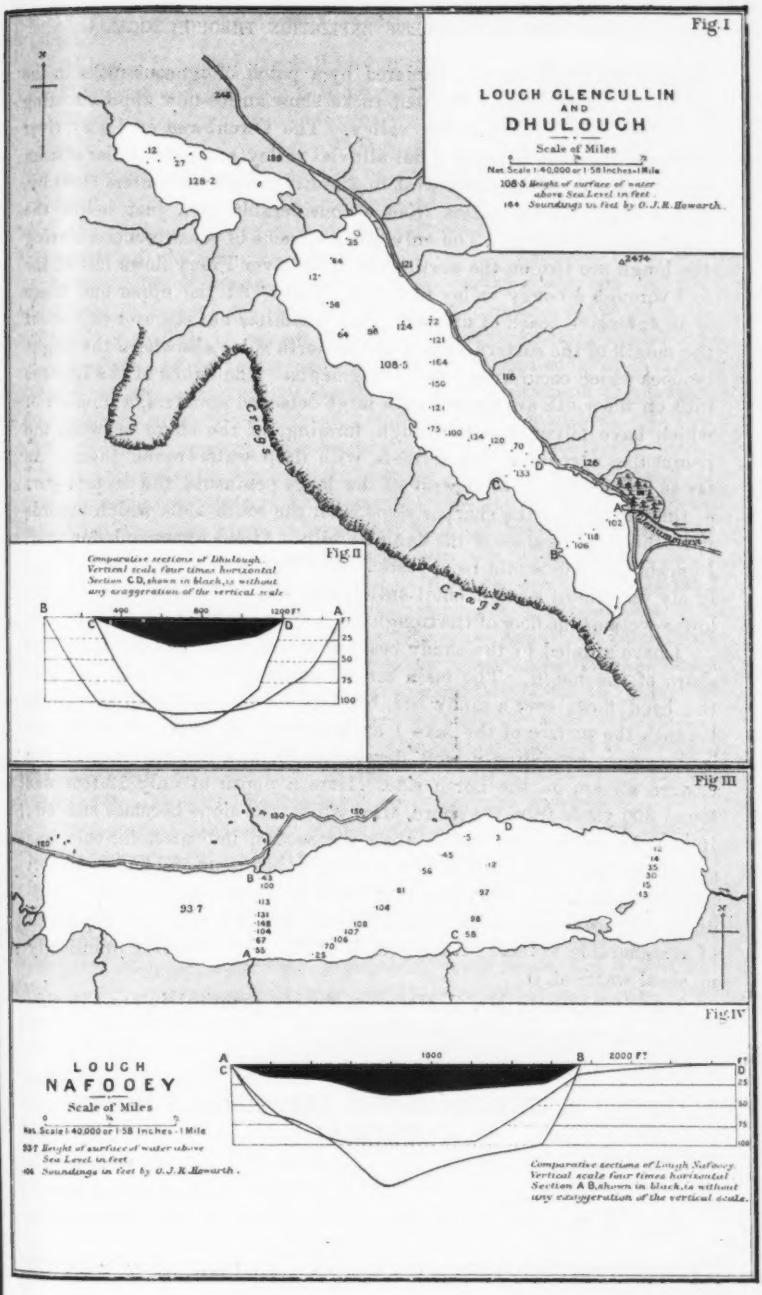


Fig I
LOUGH GLENCULLIN
AND
DHULOUGH
Scale of Miles
Nat. Scale 1:40,000 or 1·58 Inches = 1 Mile
108·5 Height of surface of water above Sea Level in feet.
184 Soundings in feet by O. J. R. Howarth.
Crags
Fig II
Comparative sections of Dhulough.
Vertical scale four times horizontal.
Section CD, shown in black, is without any exaggeration of the vertical scale.
B
A
C
D
400
800
1200 Ft
25
50
75
100
Fig III
93·7
Fig IV
LOUGH
NAFOOEY
Scale of Miles
Nat. Scale 1:40,000 or 1·58 Inches = 1 Mile
93·7 Height of surface of water above Sea Level in feet.
106 Soundings in feet by O. J. R. Howarth.
1000
2000 Ft
Comparative sections of Lough Nafooey.
Vertical scale four times horizontal.
Section A B, shown in black, is without any exaggeration of the vertical scale.

Most of the south shore is bordered by a patch of igneous rocks in the midst of the Silurian. Striated rocks show an ice-flow approximating to a line down the existing valley. The Owenbwee or Fooey river enters at the head through a flat alluvial valley, another smaller stream comes down from the south-west in a pretty cascade and enters close by, and a third stream enters from a considerable glen just below the south-western corner. The only other streams of consequence entering the lough are two on the north side. The river Finny flows out at the foot through a boggy valley to Lough Mask. At the upper end there is an extensive beach of fine sand, and a similar but slighter one about the mouth of the eastern stream on the north side; elsewhere the slight beaches which occur are of rocky fragments. The flanks of the igneous hills on the south are strewn with large detached boulders, a number of which have fallen into the lough, forming, off the shore between the peninsulas, a regular line of reefs, with deep water round them. As far as my soundings went west of the large peninsula, the deepest part of the trough and the sharper slope is on the south side, which accords with the relative slope of the flanking hills. At the upper end, however, I expect the case would be opposite. My deepest sounding was 148 feet in my uppermost section, but I anticipated deeper water above. On the lower sections the floor of the trough appeared almost flat, as in Dhulough.

I have alluded to the sandy beaches at the head and on the north shore of the lough. The main stream through the alluvial valley at the head flows over a sandy bed, but how far the sandbank continues beneath the surface of the lake I am of course ignorant. Such a bank is, however, exceedingly well developed off, and mainly east of, the eastern stream on the north side. Here a depth of only 12 feet was found 300 yards from the shore, after which the slope becomes sudden; it may be even more sudden than the section indicates, for this was one of the interesting questions which came before us and had to be left uninvestigated. Another was that the western stream, from an immediately adjacent glen, brings down no such deposit, although rapid and of considerable volume; its mouth is rocky, and there is practically no shoal water off it.

I am indebted to Mr. E. Heawood for his practical interest in this work both before and after its execution.

LIEUT. BOYD ALEXANDER'S EXPEDITION THROUGH NIGERIA.*

The following communication has been received by the Secretary from Lieut. Boyd Alexander; it is dated "Lake Chad, October 30, 1904:"—

"A good deal has happened since I last wrote to you from Lokoja

* See *Journal*, vol. 24, p. 589. Since the above letter was written, the regrettable news of Capt. Claud Alexander's death has been received.

in July last. No doubt you will be interested to have a rough outline of our progress and what has been done since the expedition left Ibi.

"The river column, consisting of the two steel boats and several canoes in charge of Lopes, my Portuguese collector, and manned by native porters, left Ibi for Ashaka on the upper Gongola on June 30. This journey was eventually accomplished, but not without considerable difficulties. Heavy rain-storms often delayed progress. Near the mouth of the Gongola, the Bassama tribe, who inhabit the left bank of the Benue, attempted a night raid on the boats, but this was discovered in time by the sentry. On the lower reaches of the Gongola, the natives, owing to severe famine and recent military operations, were in a state of starvation, and consequently no food could be obtained for the column. On July 30, Kombe, about 60 miles from the mouth, was reached, when the real trouble of navigation commenced. At this point the river narrows considerably to a width of about 150 yards. The bed becomes rocky and the current strong, being reckoned at 9 miles per hour. It was here that the first rapid was encountered, which involved the boats being towed from the bank for a distance of 2 miles. Beyond Kombe more rapids were met with, and the boats again had to be towed for a distance of 6 miles, while the long cane and overhanging trees increased the difficulty of this operation. On August 11 the vicinity of the Bima hills was reached, and the boats again had to be towed for another 4 miles. Four days later the boats arrived safely at Ashaka, and were successfully taken to pieces by my collector. The Gongola is subject, like all the smaller rivers out here, to a very sudden rise and fall. Our boats got up just at the right time—in July—in order to catch the flood. In August the river falls rapidly; by the end of September it again becomes fordable.

"On August 24 Gosling arrived, after a successful journey through the Gongola district. On August 30 a forward movement was made on to Gujiba—a good three days' march over a bad road, in many places nothing more than a quagmire. Each section of the boats was carried by four men, by means of two bamboo poles put through rings on each gunwale. By September 7 both boats and a considerable number of stores had been safely transported to Gujiba. Two days later, Gosling with the two boats left for Geidam, followed by the collector with the rest of the expedition goods. Geidam is a good five days (120 miles) to the north-east of Gujiba, and is situated about a mile from the river Komadugu. It is an important caravan centre, the goods from Kano coming this way to Kuka. On the banks of the river the boats were put together again, and the journey down to Yo was commenced on September 24. Gosling accompanied the boats, while the collector left by road, which frequently touches the river, and this enabled junctions at various places to be effected between the river and land columns. Important zoological collections were made

along the route by my collector. Nothing occurred to impede the progress of the boats, and Yo was safely reached on October 3. Yo is close to the river, and is nine hours by our boats to Bosso, at the entrance of the lake.

"The journey down the Komadugu was in every way satisfactory. Owing to the slow current (never more than 2½ miles) and its sandy bed, no snags, etc., blocked the stream. This river is very tortuous, having an average width of 40 yards, and with its low open banks in places clothed by thorny acacia good landings can be effected. From August to the middle of December the river has plenty of water, 6 to 7 feet being the average depth; but after that time a rapid fall takes place, and the river then becomes in places nothing more than a sandy bed. I think this is all I have to tell you about the river column at present. The boats have already been on Lake Chad; two have proved themselves to be satisfactory in every way.

"My brother tells me that he wrote to you from Bauchi about the survey work which was commenced at Ibi, so I will give you a rough outline of what he and Mr. Talbot have done since. From Bauchi the course taken was by Gombi and Daraso right up into the Kerre-kerre country, and from thence down the Gongola to Ashaka, where they arrived on August 17. The original scheme of triangulation in the Tonga district had to be abandoned, owing to the severe famine in the country—in fact, all along this has been one of the greatest difficulties the survey party has had to contend with. On several occasions my brother had to go long distances out of his course in order to get supplies for his men. On August 19 Talbot left for Bima, and from there penetrated into the Marghi country, but not without difficulty and opposition from the natives. In the mean time my brother traversed the Gujiba Maigumeri road, and eventually effected a junction with Talbot about three days to the south-east of Maiduguri. Up to then much useful work had been accomplished, but it had entailed arduous work. In the Marghi country the hills ceased, and heavy bush clearing had to be carried out, over a hundred men being employed for the purpose.

"I am leaving Yo to-morrow on my way to Kuka to meet my brother and Talbot, and also to select a base for the boats on Lake Chad between this place and Kuka. It is not safe to keep the boats much longer at Yo, owing to the falling of the river."

JOMOKANGKAR.

By Major C. F. CLOSE, C.M.G., R.E.

THE maps of the Tibet mission are now being drawn in the Survey of India offices at Dehra Dun. A very interesting result of the process of drawing the new maps and examining the old has been the identification of a peak to which the name Jomokangkar undoubtedly belongs.

The officers of the Survey of India who have lately been at work in Tibet report that the old explorer A-K (Krishna) was very accurate and reliable. His work, which was carried out under considerable difficulties, has well stood the test of the recent survey operations. A-K was a survey explorer from 1869 to 1884; he has always deservedly been held in esteem by the geographical world.

Now, in a map published by the Survey of India in 1872, to illustrate A-K's explorations, there will be found a mountain marked "Jhomogangar Snowy Peak," of which the position is lat. 29° 50′ N., long. 89° 50′ E. (about 215 miles north-east of Everest). This fact appears to have escaped the notice of those who have recently discussed this question of nomenclature. The name Jhomogangar has been printed on all subsequent maps of this region. For instance, on the North-Eastern Frontier Sheet, No. 6, scale 8 miles to 1 inch, will be seen the words, "Jhomogangar Snow Peak: very high."

Let us now turn to the General Report of the G.T. Survey of India for 1873–74 by General Walker. Attached to this is an appendix entitled "Account of Trans-Himalaya Explorations during 1873–74." Pages iii. to viii., written by Major Montgomerie, himself a very well-known frontier explorer, describe A-K's exploration. On page iv. of this narrative occurs the following passage:—

"On January 6 they reached Dung Chaka, 15,700 feet above sea-level. About 10 miles to the east there is a lofty snowy peak called Jhomogangar, somewhat of the same shape as the Kailás peak near Mánsarowar; it is a noted object of worship, being considered as a female divinity."

As geographical evidence, the above may be preferred to anything produced by Sarat Chandra Das, on whose authority the identification of Everest with Jomokangkar mainly rests. Colonel Waddell, who supported this identification in his book, 'In the Himalayas,' produced no fresh evidence. It is to be noted that Sarat Chandra Das, though a traveller, was no surveyor.

As regards the accomplished surveyor, A-K, he was half Tibetan by birth, a native of Milam, on the Tibet border of Kumaon, and spoke Tibetan perfectly.

It appears, therefore, that either there are two great peaks to which the natives have given the same name, or Sarat Chandra Das was mistaken; and the relative probability of these alternatives can be decided in the light of the facts mentioned above.

This note is written, not for the purpose of stirring afresh a controversy which was summed up to the satisfaction of most geographers by Mr. Douglas Freshfield in his letter to *Nature* of November 24 last, but solely for the purpose of drawing attention to facts which had slipped out of remembrance, and which have been again brought to light by the officers of the Survey of India.

THE SUBMARINE GREAT CAÑON OF THE HUDSON RIVER.

By J. W. SPENCER, A.M., Ph.D., F.G.S.

Preface.

The submarine cañon off Cape Verde, worked out in a splendid manner by Mr. Henry Benest, has already appeared in this *Journal*. That of the Congo was described earlier in Scotland by Mr. J. Y. Buchanan. The "Bottomless Pit" and Fos de Cap Breton were also shown as to their parts. Scattered discoveries of drowned valleys are many. Great systems have been worked out by Prof. Edward Hull, Dr. Fridtjof Nansen, and the writer; but the details of the cañons are not so well known for want of fuller soundings. Now, the magnificent cañon of the Hudson river is revealed to great depths, with the advantage that it is situated at the door of the American continent in place of in an obscure corner; in a region of known geology where its age can be determined; and in a locality particularly devoid of late tectonic disturbances, so that it throws much new light on the question of submarine valleys, and involves principles as important to Europe as to America, which justifies the original description appearing simultaneously in Britain as in America (*American Journal of Science*). An abstract of this paper in advance was read before the International Geographical Congress (Washington, D.C., September, 1904).

An Account of what has been done before this Date.

The early work of the Coast Survey brought to light a depression extending from near New York to the border of the continental shelf. Prof. J. D. Dana was the first to recognize this feature as the submerged channel of the Hudson river, formed when the continent stood at a greater altitude above the sea than it does now. So much importance did he attach to it, as evidence of terrestrial oscillations, that a map of it appeared in all the editions of his 'Manual of Geology,' since 1863, but only in the latest edition (1895) was it shown to reach to a greater depth than 720 feet. In the last revision the upper channel and the cañon sections are distinguished, the latter to a depth of over 2000 feet. But the discovery of the cañon was first announced by Prof. A. Lindenkohl in 1885,* and further discussed in 1891.† He found that it reached to a depth of 2844 feet, where the adjacent continental shelf was submerged to only 420 feet—a gorge of 2400 feet in depth. From the soundings beyond the deep point, he at first thought a bar of 1600 feet in height crossed the mouth of the cañon.

In 1889 I pointed out that this cañon, along with those at the mouth of the Gulf of St. Lawrence and of the Maine, could be taken as yardsticks in measuring the late continental elevation to the extent of 3000 to 3600 feet. This was in the second paper published by the Geological Society of America, the first being by Prof. Dana.‡

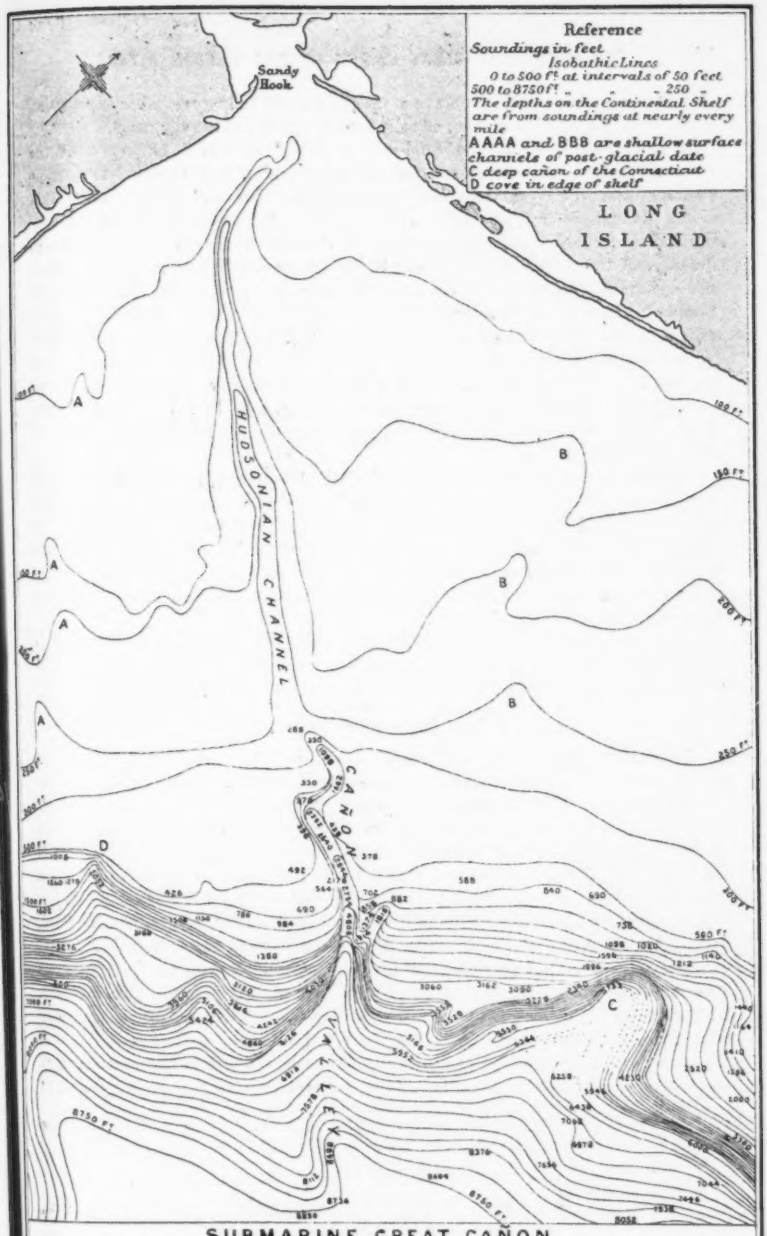
A few months later Dr. Warren Upham cited the Hudson cañon among the evidence he brought together to show that elevation was the cause of the glacial period.§ In it he attributed the apparent bar to the action of coast-wise wave-wash during the subsidence of the continent after the formation of the gorge. Though

* *Am. Jour. Sc.*, III., vol. 29, pp. 475–480 (1885).

† Ibid., vol. 41, pp. 489–499 (1891).

‡ "The High Continental Elevation preceding the Pleistocene Period," *Bull. Geol. Soc. Am.*, vol. 1, pp. 65–70 (1890).

§ *Bull. Geol. Soc. Am.*, vol. 1, p. 563; also *Geol. Mag. Lond.*, III., vol. 7, p. 494 (1890).



SUBMARINE GREAT CAÑON
of the
HUDSON RIVER
by
Prof. J.W Spencer A M. Ph D
Scale 1:800000 or 12.62 miles = 1 inch
0 5 10 20 30

this bar was a large order for wave-action, it was the only reasonable explanation of the deep hole, if such it were, as suggested by the Coast Survey chart.

Again, in 1890 Prof. Dana published a paper,* in which he says that the channel "affords strong evidence of the river origin, and therefore the whole channel up to New York was once the course of the Hudson." In the last edition of his Manual he further says (p. 948) that the former emergence of the continental border now sunken is proved by the Hudson submerged valley, citing also the cases of the cañons of the gulfs of St. Lawrence and Maine, mentioned above, as evidence of the elevation of the region in the glacial period to at least 3000 feet. It may be here stated that Prof. Dana, on seeing my account of the submarine valleys of the West Indian region, wrote to Prof. Lindenkohl, who replied that he was not aware of them, and hence the note in his Manual concerning them (p. 949). Prof. Lindenkohl, however, later accepted my interpretation of the much deeper valleys † which Dana doubted, confirmed by Prof. Lindenkohl's want of knowledge at the time, though Prof. Dana accepted my St. Lawrence cañon to 3600 feet below sea-level.

In 1897 I read a paper before the British Association, stating that with the very insufficient soundings, the Hudsonian valley was recognizable to a depth of 12,000 feet,‡ illustrating how we may anticipate where cañons may be found. This paper,§ amplified into "The Submarine Valleys off the American Coast" in 1902, taking such phenomena as a whole, showed there was accumulative evidence suggesting that these submarine features were gauges for measuring the late great continental elevation.

The most recent discussion, including that of the Hudsonian channel (1904), is in Dr. F. Nansen's epoch-making monograph on "Continental Shelves and Previous Oscillations of Shore Lines," ‖ reserved for later consideration.

The Hudsonian Cañon.

The channel described by Lindenkohl begins about 10 miles off Sandy Hook, and extends for 93 miles before it plunges into the cañon. Land miles, and not sea miles, will be used throughout this paper. At its head, opposite Sandy Hook, the channel is buried by the sand of the coast-wise drift-forming bars, though nearer New York it is much deeper. Lindenkohl had described the depth of the cañon to 2844 feet below sea-level, with a bar in front, and no further information is shown on the U.S. Coast Survey charts. In revising my last-mentioned paper, I found much additional data on the charts issued by the Hydrographic Office, greatly strengthening the evidence of the continuation of the Hudsonian valley, extending down the continental slope to great depths. But on the British charts I made a most astounding find of three soundings of 459, 801, and 229 fathoms. The position of the 459 and of the 801 soundings of the British chart so closely coincided with those of the Coast Survey chart ¶ at 213 and 345 fathom points that they could not have been represented on the same charts. Thus the British chart showed no barrier to the cañon, and very greatly increased the known depth of

* "Long Island Sound in the Quaternary Era, with Observations on the Submarine Hudson River Channel," *Am. Jour. Sc.*, III., vol. 40, p. 425 (1890).

† *Bull. Geol. Soc. Am.*, vol. 14, p. 226 (1903).

‡ Ibid., pp. 207–226. § Ibid.

‖ "The Bathymetrical Features of the North Polar Seas, with a Discussion of the Continental Shelves and Previous Oscillations of Shore Lines," by Fridtjof Nansen, Quarto, pp. 1–232, plates 28. Published in English by the Fridtjof Nansen Fund for the Advancement of Science, Christiania, 1904.

¶ Coast Survey Chart, No. 8. B.A. Chart, No. 2480.

the narrow gorge, further defined by the 229-fathom point. The extraordinary depth would have been startling had it not been anticipated in all of my long series of analyses of submarine valleys. Both series of soundings were correct, the deeper ones having been made by Lieut.-Com. Z. L. Tanner* in 1883, in the Fish Commission steamer *Albatross*. The older soundings had been retained on the Coast Survey charts.

The cañon of the Hudson river may now be extended and revised as follows: The mean edge of the continental border may be taken at a depth of 450 to 500 feet below sea-level. The head of the cañon, in a direct line backward of the edge of the shelf, is 20 miles, but its course is somewhat longer. The upper channel has a depth of 42 feet in the very level sandy plain, which is then submerged to only 288 feet (though 100 miles from New York harbour). At this point there is an abrupt descent from the bed of the upper part to 1098 feet in the cañon, within the distance of about a mile. The gorge soon deepens to 1242 feet, where cross-section A is taken.

The cañon extends nearly due east for 6 miles, where its depth reaches to 1662 feet. It then bends sharply at right angles to the south, and at 12 miles from its head a narrow inner gorge descends from 1770 to 2292 feet (in a distance of 1·5 mile), where the broad outer cañon attains a depth of only 1500 feet below sea-level. Here the shelf is submerged about 250 feet; accordingly the outer and inner cañons have respective depths of 1250 and 2050 feet. A cross-section is shown in Fig. E (added since paper went to press), which is located near the soundings of 2292 feet shown on the map and longitudinal section. Here the cañon turns again at nearly right angles towards the east, though farther on it bends slightly south-eastward. A depth of 2640 feet is reached in 18 miles where cross-section B is taken. At 23 miles the depth is 2844 feet, and at 26·5 miles is the position of the 213-fathom sounding, which was supposed to have indicated a bar, and close against which is the discovered sounding of 459 fathoms, as shown in the precipitous wall in cross-section C. Nearly midway between these soundings is one of 457 fathoms (the last two not being situated quite in the centre of the channel). These, with others on record, but not shown on the published charts, form a chain of soundings from 1 to 2 miles apart, reaching to near the floor of the inner gorge, thus establishing its continuity. At this locality, also, unpublished soundings further show the double cañon, the outer of which, with a breadth of 4 miles, is revealed to a depth of 1200–1300 feet below sea-level, while the inner has a width not exceeding a mile, but reaches to over 2800 feet. The gradients and depths of the cañon and their relation to sea-level are shown in the longitudinal section, Fig. 1. At 31 miles the 801 fathoms is found, close against that of 345 fathoms, not shown on map. This last is on the side of the gorge of 3800 feet, where the continental slope is further submerged 1000 feet. Here, too, is a great downward pitch in the gradient of 2000 feet in 4 miles. At this point the maximum breadth of the gorge, nearly 3800 feet above the floor of the cañon, does not exceed 2 miles, with the bottom necessarily narrower. Seemingly, part of the slope of the wall where the deep sounding was found approaches 60 degrees. At 34 miles there is a short tributary from the north, heading in a typical cove. Beyond this point, where the sounding is more than 4806 feet deep, the cañon feature must continue for several miles at least. I have carried it to the 42-mile point, where the continental shelf is submerged to 3000–3500 feet. At this depth we have several soundings, which show that the 3000-foot isobath continues in a direct

* Hydrographic Notice to Mariners, No. 56 (1883).

line, as if across the cañon, without any known suggestion that it sweeps round into the form of a broadened embayment. Its parallelism to the 500-foot line of the edge of the shelf shows the remarkable regularity of this zone of the great slope. There is also suggested the remains of a shelf or bench of depth corresponding to the Blake plateau south of Cape Hatteras.

Within a few miles the cañon appears to broaden out, and yet at 48 miles there is a steep cliff of 2000 feet or more on its southern side. Here the floor exceeds a submergence of 6126 feet, as the measurement is not in the centre of the valley; nor have we obtained the sounding on the opposite northern edge, the last in the gorge being 4800, confined within walls of 3800 feet, though the walls are known on both sides lower down. Indeed, this depth is still below that of the continental slope at 48 miles. Evidently the cañon section must reach to a depth of from 6000 to 7000 feet, which also corresponds to the deep valley of the Connecticut (C on map).

Beyond the cañon section is the southern side of the extended valley, demonstrated by a line of soundings, though not at its summit. The four soundings at about 8688 feet are specially important as proving the continuation of the Hudsonian valley. The first of these is at 63 miles. At 67 miles the lateral bank is at least 624 feet high (probably 1000 feet at least above the floor), and our record carries the valley to 71 miles from the head of the gorge. The end of this lower reach does not exceed 14 miles in width, but fuller soundings may limit it to 8 or 10 miles. Thus the valley is shown to exist to a depth of 9000 feet.

Beyond this point there are no soundings in the line of the valley, but lateral ones on both sides are suggestive, and at 100 miles east of this study, at a little less than 12,000 feet, is an embayment of 30 miles in breadth, with the depth of a few hundred feet. This cannot be a meaningless feature, though not part of the present analysis.

The breadth of the cañon hardly exceeds a mile at its head, but it soon widens to 2 miles or more. From the second turn (see map) a breadth of 4 miles is maintained for the outer cañon. The deeper inner gorge is reduced to a width of a mile or less, and is more sinuous than the outer. Beyond the tributary it is wider, 5 or 6 miles, though possibly more, as the next sounding is farther away; but a little greater or less detail does not alter the general features, and the only important points left relate to the question of the cañon opening out into the valley and its depths, which the analysis shows is 6000 to 7000 feet, and farther on the characteristics are those of a valley rather than a cañon to 9000 feet below sea-level.

Surface Channels of the Continental Shelf and the Deep One of the Connecticut.

The surface of the continental shelf is a marvellously flat plain, with a mean slope not exceeding 3 feet per mile. This condition represents a flat substratum, even though there may be hollows in it levelled over by sand deposits. Nearer than Long island there is no trace of a moraine, either buried or submerged. The surface of the plain is covered over with sea-washed sand, except in the Hudsonian channel. This adjective termination I have long used to designate the drowned sections of the river valleys. The sandy plain is traversed by shallow channels shown on each side of the map at AAAA and BBB. These would be still better followed if more isobathic lines were introduced. It is to a depth of 250 feet that these channels are most noticeable. They represent the stream-action of an epoch of elevation to this amount since the time of cañon-making, and subsequent to the levelling over of the plain after that date. That is to say, these channels absolutely

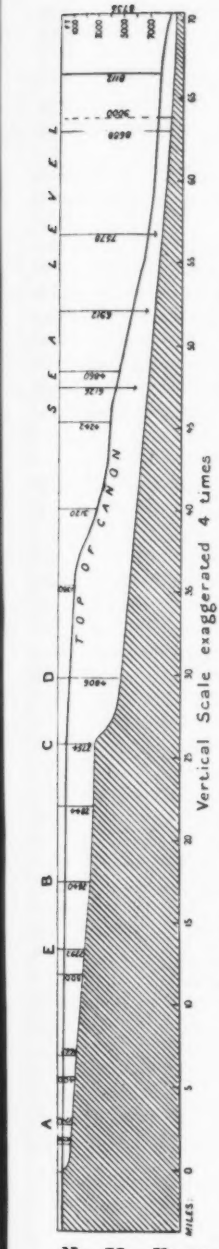


FIG. 1.—LONGITUDINAL SECTION OF SUBMARINE GREAT CAÑON OF THE HUDSON RIVER.

At points where depths end in arrows the soundings were not taken in centre, but on side of the valley. A, E, B, C, D, location of cross-sections. E is situated 4 miles above B. Soundings given in feet. Since going to press, from additional information, abrupt steps of 400 and 500 feet respectively are found to occur in the gradient just above depths of 1662 and 2292-foot soundings.

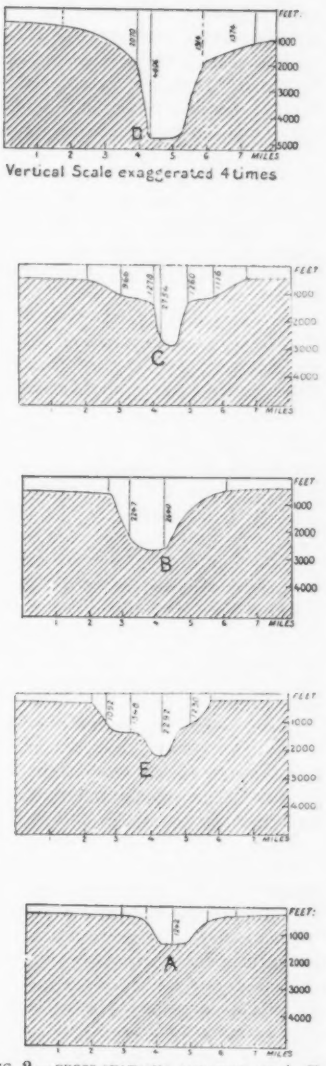


FIG. 2.—CROSS-SECTIONS LOCATED AT A, E, B, C, D, IN LONGITUDINAL SECTIONS.

Their position on map corresponds to similar depths, in feet, there shown. E (at a point 4 miles above B) and C show the double character of the cañon.

belong to a post-Columbia or Pleistocene epoch, the cañons to a pre-Columbia or early glacial time. During the Columbia oscillations wave-action has obliterated all traces of delta forms.

The channel of the Hudson river, in crossing the submarine plain, shows a bottom of blue clay with sandy material in places; but the course of the old upper channel must have been still defined to have allowed its reopening during the epoch of re-elevation of 250 feet just mentioned.

In the cañon section, the bottom is composed of blue clay with fine sand. Outside it the continental slope is also surfaced with blue clay or green clay, as shown by many soundings.

The great Connecticut cañon or valley, asked for by Lindenkohl,* is represented (at C on the map) by a deep embayment, whose west wall is at least 3600 feet high, and it reaches to a depth of 5736 feet below the surface of the sea, but the information is not at hand to define its form, though a cañon, perhaps passing into a valley at this point, might be expected.

At D, on the other side of the map, one sees a cove or amphitheatre such as are commonly indenting the borders of high plateaus. I may have too strongly represented the feature on the map, but it is not one of special importance.

Constitution of the Continental Shelf.

All our classic teaching tells us that, during the earlier and middle Mesozoic era and far into the Cretaceous period, the continent here was so elevated and subjected to denudation that the sediments were carried far seaward. We cannot go into the question as to their covering the continental slope, but it would seem that the continental shelf now submerged was subjected to the same conditions as those underlying the coastal plains of the adjacent lands. On these we learn that, besides a few hundred feet of Potomac sands which probably thin out, there are deposits of sand, greensand, clay, and clay marl of the Upper Cretaceous formations, reaching a thickness of 800 to 1100 feet. Then follow some Eocene sands, succeeded by clayey, marly, and sandy beds belonging to the Miocene beds. These occur in an artesian well boring at Atlantic City, reaching to a depth of 1400 feet (without penetrating the series or the limited Eocene sands or obtaining water at the lower depths, though somewhat higher fresh water occurs, indicating the leaching out of the salt sea-water during an epoch of elevation). All below 265 feet is Miocene. This upper part is composed of sand, gravel, and clay, which may represent important features requiring a word of explanation. Of red gravel, sand, and stiff clay loam are composed both the Lafayette and Columbia formations, each of which is a thin sheet, except where filling valleys. The Lafayette is provisionally regarded as belonging to the end of the Pliocene period, occurring below morainic material, as I have seen in New Jersey; but it has been enormously denuded. The Columbia formation (now subject to subdivision) is the material of the Lafayette redeposited, and overlies the drift, with its surface only moderately sculptured. I should suspect that at Atlantic City is a buried channel filled mostly with these deposits of the Columbia period, capped with more recent alluvium. These upper beds are substantially horizontal, with the Miocene dipping a little more. For the details of the Miocene deposits in the Atlantic City well, see the paper by Mr. L. Woolman.†

Thus not knowing whether these incoherent formations have a greater or less aggregate thickness beneath the submerged coastal plains, there are only known

* *Bull. Geol. Soc. Am.*, vol. 14, p. 226 (1903).

† *Acad. Nat. Sc., Phil.* (1887), p. 339; and vol. for 1890, pp. 132-147.

little over 2200 feet to be accounted for from the adjacent shores. But they have formed the sub-surface of the level plains now submerged, and channelled by the drowned Hudson river, and finally incised by the cañon on the continental border. Here, then, in its upper portion the gorge penetrates easily denuded material, though some of the beds are composed of remarkably tough clay. Where the sides of the cañon are so precipitous as was shown at the 459 and 801-fathom isobaths, we may suppose that the lower portions are cut out of the harder older rocks, succeeded by more yielding material farther down the submarine valley.

Origin of the Cañon.

It appears that the previous students of the submarine channel have all had the idea that it was formerly a land valley. Such analysis of the phenomena as has been given must be used in discussing its origin under any other hypothesis. While a few other soundings are desirable for fuller local details, we need not one more for a reasonably full discussion of the principles involved—only enough are wanting to stimulate interest in a revision. Not to speak of similar phenomena farther south and in the West Indies discovered by myself,* and those since brought to light and systematized in a brilliant manner by Prof. Edward Hull, of London, situated on the eastern side of the Atlantic basin,† I shall mention the cañon of the Congo, discovered by Stassano, and worked out by Mr. J. Y. Buchanan and described by Mr. Edward Stallibrass, and the cañon off Cape Verde, described by Mr. Henry Benest, on account of the completeness of detail of such features, not hitherto obtained, but with which the Hudsonian cañon can now be grouped with the advantage of our knowledge of the surrounding physiographical and geological environments, and with the further interest in that it is situated at the main door of the continent.

If formed by river action, the Hudsonian cañon affords proof of startling physical conditions of the region at a very late date, and hence the whole interest in its origin; for if now a land feature, it would be one of not such unusual occurrence as to awaken our amazement. Can the views of the earlier writers be challenged? The only other possible causes of its origin seem to be—(1) Submarine glacial erosion; (2) open faults; (3) submarine rivers; and (4) a remnant of a primitive depression. This last would only be suggested by an obstinate objector to its fluviatile origin, or one unfamiliar with the analyses of such subjects; for after passing the Palæozoic evolution of the continent, what is now its great slope should be covered with detritus carried into the sea during the long period of denudation of the Mesozoic era, thus obscuring older depressions. Some of the African cañons have been attributed to submarine rivers. By this the hypothesis of a great elevation of the continent was avoided. There seems nothing in its favour beyond the occurrence of river valleys at great depth and some floating *débris* on the sea. As Prof. N. S. Shaler says, subterranean channels must be formed above the base-level of erosion, and the establishment of such must precede that of submarine rivers, which soon lose their effectiveness.

Can the question of cañons be cavalierly disposed of by calling them faults? The level continental shelf is covered with Tertiary sands and clays, such as would not favour an open-fault theory. The submarine topography on both sides is identical, suggesting not the slightest disturbance to leave an open fault, nor is such shown on the land adjacent. Joints and faults may locate valleys, but the

* "Reconstruction of the Antillean Continent," and other papers in *Bull. Geol. Soc. Am.*, and in *Quar. Journ. Geol. Soc. London.*

† Published by the Victoria Institute, London.

submarine shelf is only a new plain prolonging the Hudson valley, which in slowly rising would force the water to follow the lowest course. The fault theory is not supported by the Great Valley of the Appalachians, extending for 1000 miles, with a breadth of from 20 to 40 miles. And it is in a region abounding in fault; yet the valleys, as have long since been shown by Profs. Lesley and Dana, and others, are those of denudation, and which I have confirmed in Georgia. Even the gorge of the Delaware Water Gap, where more than a tyro might be pardoned for suspecting a fault left open, is not such according to Prof. Lesley and Mr. Chance, the geological surveyor of it. The submarine cañon of the Hudson, which is double, the inner the more sinuous, does not lie in a direct line, but turns twice at right angles within a distance of a dozen miles, and below it widens into a fan-shaped valley. Nansen has described many submarine valleys in the continental shelf of Norway and about Iceland, and does not find it necessary to call in the existence of faults; and even where my evidence has not been full in treating deep submarine valleys, he thinks there is no other feasible explanation than that the valleys are sunken land features (p. 192). Nor will those who appeal to Sir A. Geikie find much comfort in faults. He says, "To many geologists the mere existence of a valley is evidence of the presence of a fault," and that "in every case actual proof of a fault should be sought for in the tectonic structure of the ground. . . . In the vast majority of cases in Britain valleys have no connections with faults." From its forms and its associations, I think we can dispense with the idea of a fault-made rift, unaffected by atmospheric action. And, furthermore, this is not in the region of apparent great tectonic disturbances, but one of remarkable simplicity, since in Cretaceous times.

Finally, I know of no other reason for appealing to faults as the cause of such a submarine feature, except as a last resort from accepting the evidence as is set forth in this paper, unless such a reason can be shown to exist, other than by negative or insufficient evidence.

As for submarine glacial erosion, I have shown that there are no features of the shelf suggestive of the occurrence of glacial action, even though such reached to Long Island and New Jersey. Furthermore, it could not have possibly extended to the great depths of the cañon and the continuing valley. Of this question Dr. Nansen says in his great monograph, "The drowned valley of the Hudson river cannot possibly have been reopened by submarine glacial erosion; it is too long and narrow and deep" (*Op. cit.*, p. 192). Its analogues of the tropics are situated beyond glacial action.

Of the drowned valley of the Gulf of St. Lawrence, Prof. N. S. Shaler also writes, but I do not remember whether he considers the then discovered Hudson river cañon.

Returning now to long-accepted fluviatile origin of the submarine channel, let me call attention to the very close resemblance of the cañon, as shown on the map, to the gorge of the Niagara, also excavated out of level plains, far from mountains, in front of which are great slopes to lower levels. But this portion of the Hudsonian cañon is 30 miles long and reaches to thousands of feet in depth, while that of the Niagara is only 7 miles in length and now 440 feet deep. So, too, the cañon of the Hudson is just like the *barrancas* on the high plateaus of Mexico and Central America, starting in level plains, and then suddenly transforming themselves into rapidly descending cañons, which later widen out into such valleys (as we may see in the east, which have reached more mature forms), whose descent from the plateaus of thousands of feet in height is not by regular gradients, but commonly by a succession of great steps.

The Magnitude and the Time of the Great Elevation.

While it must have taken the Hudsonian cañon many millenniums to have formed, yet it presents a youthful feature, in strong contrast with the valleys on the eastern side of the American continent, while its submerged marginal shelf is not deeply indented, with its surface scored into a succession of ridges and hollows. Even though many of the underlying rocks may be of a resisting nature, yet the period of cañon-making must have been one of limited duration. This is further suggested when considering the size of the Hudson river, which probably carried down glacial waters and detritus for a portion of the period. Outside the limit of the Hudsonian river, the surface of the now submarine plain was not deeply scored as with atmospheric agents acting for long ages, as would have appeared beneath the superficial mantle had such obtained. One condition might modify this last argument, namely, a subsequent long epoch of wave-cutting, with the removal of the prominences, such as Nansen describes in his "coast platform," which does not exist here, but in such a case the Hudsonian gorge should have been filled with *débris*.

In the region of the Great Lakes, from the tilting of beaches, I have worked out great epirogenic movements, and it quite prepares me to expect to find a reduction of the amount of elevation of the continent, represented by the present submergence of the valleys along our continental margin due to bending downward of the continental slope, but this would not reduce by any amount that determined in the cañons and the necessary slope of the land surfaces. So, also, when we find subaërial features submerged, they at least would need to have been depressed to the depth they are now found at, no matter what the cause of depression.

The cañon section has sunken 6000 to 7000 feet, and the valley beyond to 9000 feet. Did I attempt to guess at the reduction of this amount in the late height of the continent, I should be inclined to pause, owing to other features outside the line of this study. But if others wish to reduce the continental elevation by 2000 feet, by extra bending down of the continental slope, I shall not protest further than by stating that additional evidence beyond our limit may replace it. Provisionally, then, we may keep the amount of elevation at 9000 feet, as shown here, leaving others to correct the figures if found to be excessive. On the other hand, I have no idea that the present heights of the mountains were relatively nearly so great as now.

Fragments of the Lafayette formation should extend from New Jersey, and underlie the surface of the continental shelf. The great denudation of the region was after the Lafayette period, as was proved by Prof. W J McGee. I have found these beds underlying glacial deposits in New Jersey. They are provisionally regarded as Pliocene, unless they are pre-glacial Pleistocene, as thought by Upham. On the surface of the overlying till rests the Pleistocene Columbia red loams, sands, and gravels, in samples not distinguishable from those of the Lafayette formation, except in the smaller size of the gravel. And it is such materials which are obtained in the Atlantic City well (Woolman). The denudation of the Lafayette has been so extensive, that its remains would be more likely outside of a channel, buried as this appears by the Columbia formation, which has levelled over and furnished materials for the surface of the continental shelf before the re-excavation of the small channels at AAAA and BBB on the map (p. 18). These channels, as mentioned before, represent a re-elevation of the drowned plain to as much as 250 feet in the later Pleistocene period, since which time the region has been again once or twice depressed, then re-elevated slightly and channelled, and is now sinking at the rate of 2 feet a century (Prof. Mitchel). All the changes are remarkable repetitions of those which I have shown to have occurred farther south and in the West Indies. Thus it may be seen that the cañon-making period was in the earlier Pleistocene, and accords with Prof. Dana's views as expressed

in the last edition of his Manual, and those of Dr. Upham, only the evidence is in more detail, showing a much greater elevation than was then known.

I have not touched upon an earlier Tertiary valley, as such could apply only to great depths beyond the cañon section.

Summary and Conclusion.

More than forty years ago, Prof. J. D. Dana first recognized the submarine extension of the Hudson river in the soundings on the continental shelf. In 1885, Prof. A. Lindenkohl discovered the channel suddenly transformed into a cañon near the continental border, reaching to a depth of 2400 feet below the surface of the submerged plain, which is here about 400 feet beneath sea-level; but near the then known mouth there appeared a great bar. In 1897 I pointed out that the channel was traceable to great depths, which is now proved. A sounding was made near the supposed bar, which has proved to be only a measurement taken on the side of a deep cañon, with a precipitous wall. Then 4 miles beyond this point, against another lateral bank, a further sounding reaches to 4800 feet, revealing a cañon 3800 feet in depth, where the continental shelf is not submerged more than 1000 feet. High up on the sides, the gorge here is less than 2 miles wide, but the incision of the outer cañon into the shelf has a breadth of 4 miles. At its head the cañon begins in an amphitheatre, having a descent from 330 feet to 1100 feet in the distance of about a mile. Two more steps, of 400 and 500 feet respectively, follow. Again, between 27 and 31 miles below its head there is another great step of 2000 feet to the depth of 4800 feet mentioned, and the gradient below is probably by other great steps. This is just beyond the border of the submarine plain, and shows the cañon with a depth of 3800 feet. The cañon is double; a second or more sinuous inner gorge traverses the outer. A little farther on is a tributary heading in a cove. At 42 miles the cañon begins to widen into a valley, which at 48 miles has a precipitous wall of 2000 feet in height. The valley opens into an embayment or wider valley, which also receives that from the Connecticut, now discovered to a depth of about 6000 feet for the first time, but without details to describe its form. In cutting through the continental bench, at 3000 to 3500 feet beneath sea-level, the floor of the cañon is between 6000 and 7000 feet below the surface of the ocean. The valley is continuous to a point 71 miles from the head of the gorge, and where it is recognizable at a depth of about 9000 feet.

The cañon and valley discovered to the great depth shown, incising first the level continental shelf (in which it turns twice at right angles), and then coursing down the great continental slope, is now taken as a gauge for measuring a late high continental elevation of the region to the extent of 9000 feet. This is following out the lines of Dana, Lindenkohl, and other students of the submarine channel, in that they considered it a drowned land valley. I have analyzed every other known possible cause of its origin. So great are the probabilities, and so long have these been accepted unquestioned, that very strong proof would be required to modify this view.

The period of the great elevation has been found to coincide with that of the early Pleistocene. Since then there has been a subsidence to somewhat below the present level, followed by a re-elevation of 250 feet, as seen in the shallow channels of the shelf. With other minor changes, the region is now sinking at the rate of 2 feet a century.

This cañon feature at our door corroborates the great changes of level worked out most extensively by Hull of Britain, Nansen of Norway, and myself here and in the West Indies, following methods which the father of geography, Prof. J. P. Lesley, predicted, in 1888, "must throw light on the whole subject of elevation and subsidence, as applicable to the entire area of the United States."

ON THE METHOD OF STUDYING THALASSOLOGY.*

By Prof. LUDOVICO MARINI.

The scientific study of the sea, initiated by the genius of the Bolognese, Count Luigi Ferdinando Marsigli,† at the end of the seventeenth century, was not developed till the second half of the nineteenth century, after the American Maury had shown what important applications it was capable of. And this late development is readily explained, especially when we consider the great resources required by this study, owing to the vastness of the field to be explored, and the difficulty of reaching the greater part of it with available instruments of observation, and also have regard to the complex character of the science itself. And, in truth, the objects of thalassology are the phenomena which take place in the sea, and may be either of a physical or a chemical nature, so that recourse must be had to both of these sciences. And, moreover, for a complete knowledge of the conditions under which these phenomena occur, it is necessary to understand the nature, form, and constitution of the bodies by which the marine waters are limited—that is to say, the atmosphere above, the solid crust of our planet laterally and below; and, lastly, since it is important to be able to localize the facts according to their quality and intensity, meteorology, geology, and geography have also their share in these studies. Yet, despite its late origin, this science has already, in little over half a century of life, acquired such importance that even our Governments are making great outlays in organizing expeditions, in maintaining fixed establishments, and subventionizing associations engaged in furthering and encouraging such researches.

An indispensable condition for acquiring a really scientific knowledge in any department is the employment of a suitable method of study. Hence, if we wish to examine the data already acquired, in order to make them the starting-point for further research, it is above all necessary to inquire whether the method hitherto employed and to be employed in future is adequate for the purpose.

In determining the nature, form, and conditions of the bodies in contact with the marine water, as well as the values of the physical and chemical elements by which it is specialized, we may have two objects in view, whence it results that thalassology may be divided into two main sections. And, in fact, all those elements have different values, both in the same locality at different times and at the same time according to the locality. Hence we may undertake to determine the variations that they undergo from time to time in a given place, and calculate the mean values as may be required, and this constitutes a first part of thalassology analogous to that which in meteorology takes the name of climatology. Then from the difference in the values of the various elements in the different places, the conditions of equilibrium not being satisfied, there results a movement, a purely physical phenomenon, which constitutes the object of study of the second part—dynamic thalassology.

It is evident that the division made by me concerns the scope which may be given to thalassological investigations, not simply the division to be adopted in

* Memoir presented to the Fifth Italian Geographical Congress, held at Naples in April, 1904.

Touching the term "thalassology" I here employ, though generally little used, see Thoulet, 'Traité d'Océanographie,' vol. 1 (Statique), Introduction.

† See Prof. Cosimo Bertacchi, "Geografi italiani all' estero," *Memorie della Soc. Geogr. it.*, 1898, vol. 8, part i. *Id.*, "L'Italia e il suo Mare," *Bol. della Soc. Geogr. it*, 1900, 4th series, vol. 3, p. 762.

the compilation of a treatise on the subject. In this case it is necessary to consider the natural conditions in which the sea-water is found in contact with the other bodies by which it is limited, and their mutual relations; also to give a detailed explanation of the physical and chemical properties that characterize it, such as its chemical constitution, specific heat, melting temperature, dilatability, compressibility, thermic and electric conductibility, transparency under thermic, luminous, chemical radiations, etc. While these form the essential base of every such study, they are yet not so well known as they should be.*

It seems to me even important to note that the expression *marine statics* employed in many recent treatises, in order to distinguish this preliminary part, is not appropriate; for, although the tendency towards equilibrium is always operating, since the causes that disturb it also continue constantly to operate, actual equilibrium is never reached. It is well to avoid such an erroneous expression, since it might lead to serious errors were problems essentially dynamic to be regarded as purely static.

The biological section, which is often added to these two parts, does not, strictly speaking, come within the scope of thalassology as here understood. To wish to introduce it would be like wishing to regard the study of the distribution of the birds and insects that fly in the air as a part of meteorology, because the habitat of the various species and the migrations made by some of them depend on the changes of climate, and may serve to indicate them. In both cases the study of the distribution of organisms constitutes an important application of the respective sciences, and thalassology even owes to biological researches the chief impulse to its study.

The difference between the two parts here distinguished by no means consists in the difference between the objects of study, because the elements in which the second is interested also form the subject of research for the first, which, however, is likewise occupied with some other matters with which dynamics are not concerned. The real difference consists mainly in the method employed in accordance with the objects aimed at, a method purely statistic in the one case, synchronous in the other. But in order that the data may be discussed, and thus lead to practical results, they must be collected in a way that may satisfy the requirements of both methods. Hence this is chiefly what should concern us, if we wish to arrive at right conclusions, that is, such as correspond to the facts.

It is certain and self-evident that the method of continuous registration carried out at most of the stations conveniently distributed over the whole space occupied by the whole oceans, satisfies all requirements. But in the present state of the science it is impossible to give it practical effect, especially at great depths and on the high seas. Hence, for researches to be made in those parts there have been organized great expeditions which, ranging over a vast oceanic region, collect thalassological data here and there, in different places, at different times (excepting the vertical series of temperature and density). From materials thus collected we may say at once and without hesitation that, speaking generally, no conclusions can be drawn. It is evident that they are in no way capable of being compared together, having nothing in common in respect of time or place. The truth of this principle was already fully recognised so far back as 1890, when, by means of the highly developed investigations in the northern seas, the variations that take place from season to season were determined

* Sandström und Helland-Hansen, "Ueber die Berechnung von Meeresströmungen," *Report on Norwegian Fishery and Marine Investigation*, vol. 2, 1902, No. 4, p. 25.

beyond all doubt.* Hence, in the impossibility of obtaining a continuous record, taking advantage of the slowness and sufficient regularity with which the variations of the oceanic elements occur, in order to facilitate the solution of the problem, it was thought advisable to limit to three months the interval of time in which it might be permitted, at least in a general way, to compare each successive series of observations one with another. On this principle was based the plan proposed by Profs. Pettersson and Ekman at the Sixth International Geographical Congress in London in 1895, for an international study of the northern waters.† But from the results of the first years of their investigations we arrive at the conclusion that variations of great range take place in the conditions of thalassological elements, even from month to month, variations which cause equivalent modifications in the type of circulation, which hence becomes distinctly different at the same period in different years, and of such variations no chart of mean conditions can give any information. In accordance with this very fact, in the bulletins issued by the International Committee for marine exploration,‡ the isothermal lines are scarcely traced at all, and on the few given isohalines doubts are even suggested regarding their real values, these being reduced from observations taken during a period of over one month. Hence it results that, for the purpose of perfect comparison of observations, at least in the upper strata, which, on the other hand, for many reasons are the most important, and particularly in places subject to great and rapid variations,§ in order to draw legitimate consequences, a more rigorous synchronism is needed. Therefore, in the present state of the science, and without excluding all efforts to achieve whatever may seem to be the best, the observations carried out in exploring ships under sail are by no means to be regretted. On the contrary, they should be multiplied to the utmost, always taking the greatest care that the records be obtained with absolutely identical methods, and so that complete confidence may be placed in their accuracy, and that they be determined on plans first thoroughly studied and laid down by means of preliminary observations. To complete the significance of these values, obtained thus independently and at intervals, the stations should be utilized where the records could be made continuous, that is to say, stations either established on *terra firma* along the seaboard, or else afloat on the light-ships, or on the model of the Scottish Ark. No valuable results can be expected until we possess a large number of values obtained in this way and then subjected to a rigorous criticism, such as that which in meteorology is applied to observations taken discontinuously. Then it will be possible, not only to know the average conditions of a region, but also to infer, which is the object of true science, what are the laws of phenomena having their bases in the sea and relations to the surrounding terrestrial surface and the atmosphere above; and to give in this way a scientific basis to the desired prognosis of the thalasso-meteorological phenomena. And meteorology, a science

* Without quoting numerous authorities, I may here refer to the monograph of H. N. Dickson, "The Circulation of the Surface Water of the North Atlantic Ocean," *Philosophical Transactions R. Soc.*, London, Series A, vol. **196** (1901), pp. 61, where is given a full bibliography of the subject.

† Pettersson, "Ueber die Beziehungen zwischen hydrographischen und meteorologischen Phänomenen," *Meteorologische Zeitschrift*, 1896.

‡ "Conseil permanent international pour l'exploration de la Mer.," *Bul. des Résultats acquis pendant les courses périodiques*, Nos. 1, 2 (1902), Nos. 3, 4 (1903).

§ M. Knudsen ("L'Océanographie des détroits danois, La Géographie," *Bul. de la Soc. de Géographie de Paris*, vol. **5** (1902), pp. 21) states that observations in the Danish waters, subject to very sudden changes, have been taken, under the direction of Admiral C. F. Wandel by several vessels simultaneously, so as to complete the necessary records in twenty-four to forty-eight hours.

so closely related to thalassology, but more advanced, should serve as its model, if it too is to progress on strictly scientific lines. At the same time, meteorology also affords proof of the importance of continuous registration for determining averages, since it shows us how a true method of obtaining the mean temperature with non-continuous observations was not obtained until a way was found for determining the true mean from continuous records.

Assuredly the most important problem in thalassology is that of oceanic circulation, about which, however, diverse views are entertained by thalassologists. We have, first of all, carefully to distinguish the object aimed at, whether it be the mere verification of the facts, that is, of the course, duration, intensity of the circulating movements in view of the manifold and important effects produced by them, or else the purpose be to determine the laws of the phenomenon. The first case comes within the scope of the first part of thalassology, and in its study we have to employ both direct and indirect methods. The direct methods involve the use either of floating bodies left free to follow the movement of the waters in which they are placed, or of current-metres. The first floats may be freely cast adrift and left to themselves, the points of departure and arrival being alone recorded, in which case, apart from the doubts respecting the accuracy of the report on the spot where they have been picked up, they leave uncertainty regarding the course traversed by them; or else they may be followed by boats fixing their successive positions, and then they are available only for shallow currents, and, moreover, require much time and many hands even for the exploration of small regions. The current-metres, although requiring a great many observations to yield conclusive results, and in the state in which they actually are, must undergo further improvement in order to be perfectly and completely adapted to the purpose, still they are based on a principle which alone can afford the most complete and trustworthy indications. In the same category may be included the study of the plankton, which, especially when combined with other methods, appears to afford most valuable data on the existence of currents.

The indirect methods consist in following the variations of temperature, or of density, or of salinity, or of the volume of gases in solution. Temperature was at one time held to be the cause of marine currents;* but to it, as a sufficient element to indicate the presence of currents, no great value is now attached, owing to its extreme variability, especially under the influence of outward agencies. The density has been used by Bouquet de la Grye† and by Thoulet‡ for tracing profiles of the surface of the ocean, on the assumption that above a given level the depths are in inverse ratio to the densities, and so for deducing from the slopes of the surface the direction of existing currents. But, besides the fact that in the particular instances where the principle has been applied by Thoulet, the density-values utilized are not comparable one with another for the reasons above stated,§ and that from the value of the surface density alone the weight or the pressure of a whole liquid column cannot be deduced, this fundamental principle on which the method is based is valid only where there is equilibrium, hence cannot be applied to the investigation of the conditions that produce lack of equilibrium.

Salinity and the tenure of gas have been preferred by the thalassologists of

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* See 'Handbuch der Oceanographie, Boguslawski u. Krümmel,' vol. 2, chap. iii., with the numerous references on the subject.

† '*Annales de Chimie et de Physique*,' No. 5, vol. 25 (1882), p. 433.

‡ *Ibid.*, No. 6, vol. 14 (1888), p. 287.

§ Recently (*Comptes Rendus*, 1ᵉʳ semestre, 1904) Thoulet describes a modification to his method, avoiding only the errors arising from non-synchronism.

the International Association for marine exploration, as being suited for recognizing a portion of a body of marine water in its course across the ocean, hence useful for indicating the trend of currents generally. But neither these, nor the density, as Thoulet thinks,* nor any other element, is capable of identifying a body of marine water, as this, not being a chemically specialized body, changes with the shifting of position in space, both by diffusion and by the tendency to recover its equilibrium, the values of all its characteristic elements. Consequently, for the purpose of verifying the existence of currents, although the above-mentioned elements could often afford valuable indications, and especially be useful for a preliminary study, still they cannot be sufficient for a complete study, so that the preference undoubtedly lies with the direct methods, and especially with the records of the current-meter.

But if the object be to determine the law of the phenomenon—that is, the relation between cause and effect, we must needs verify the effect, that is the movement, and discover and measure its causes. The inquiry concerning these causes may take a twofold course; in other words, we have to seek both the conditions of the marine elements by which the movement is produced, and the external causes that bring about the removal of the conditions of equilibrium. And these external causes may be either cosmic (solar radiation, rotation of the globe), or meteorological (atmospheric pressure, temperature of the air, humidity, winds), or geographical (presence of fresh-water streams or of particular materials constituting the terrestrial crust), or mechanical (movements of other bodies of marine waters, which by their trend, or owing to the special configuration of the basins, set up secondary currents), or biological (living organisms), which causes are all revealed by the variation of temperature, the salinity,† and local pressure. Hence, it is to the direct determinations of the values of these marine elements, and to their relations with the external conditions, that we must necessarily have recourse if we wish to successfully solve the problem. Nor are we to confine ourselves to one or other of these elements; but, as all may have their influence, they have all to be considered, since otherwise, looking at the question from a single point of view, we might come to wrong or at least partly defective conclusions.

In his exposition of the results of the Norwegian expedition in the North Atlantic, Mohn, by tracing what he calls wind-surface and density-surface, and by their means determining the current-surfaces, had already by their trend deduced the direction of the currents. Starting with the hydrodynamic equations under the simplified form given by Lord Kelvin, Bjerknes ‡ demonstrates a theorem by which may be calculated the increase of circulation of a closed curve, by means of the number of solenoids comprised within it and formed by the isobaric and isosteric surfaces. In Mohn's method the elements to be experimentally

* "Quelques Considérations sur l'étude des courants marins," *Annales de géographie*, vol. 4 (1894–95), p. 257.

† In his numerous essays, Thoulet rightly insists on the importance of not separating these two elements, temperature and salinity, but of considering them together in what he calls *density in situ*. Mohn had also introduced the idea in his dynamic studies ('The Norwegian North Atlantic Expedition,' 1876–78, No. xviii., *Circulation*); and Krümmel recognizes its importance in vol. 2 of the 'Handbuch der Oceanographie,' while Savy had already made use of it in 1868 ("Sur la Densité, la Salure et les Courants de l'Océan Atlantique," *Comptes Rendus*, vol. 67, p. 483).

‡ "Das dynamische Princip der Circulationsbewegungen in der Atmosphere," *Meteorologische Zeitschrift*, 1900, p. 97; and "Das Raumliche Gradient u. Circulation," *ibid.*, 1900, p. 481.

determined are the direction and velocity of the wind, or the distribution of atmospheric pressure for deducing these elements, and the density of marine water, from which is obtained the pressure. In the method of Bjerknes, from the density alone is calculated the specific volume, and the pressure is given from depth.* Mohn, besides leaving doubts regarding the validity of the relations between the velocity and direction of the marine currents and those of the wind, deduced empirically from an insufficient number of observations, overlooks the accelerating element, specific volume, which, as shown by Bjerknes, has much influence on the nature and velocity of the movements. To the Bjerknes method it is objected† that the effect of terrestrial rotation is neglected. But at the beginning of his essay the author expressly states that this is one of the generalizations to be introduced into Lord Kelvin's equations, but that he purposely overlooked all except the more important generalization—that is, about the limitating hypothesis respecting the density of the fluid. The deviations caused by the centrifugal force can always be brought under consideration, whenever it is desired, by means of the calculus. It is further urged that he takes no account of the direct action of the wind, which is now known to be the most important cause of marine currents. Now, the action of the wind may be shown either by the waters accumulating in the direction of its movement,‡ or by the friction causing on the surface of the sea a movement of the upper particles, which is then communicated to those below. In any case, the action of the wind is displayed in the change of pressure, caused either by changing the level, and consequently the height, of the liquid column, or by producing a movement which so acts that the pressure has to be regarded rather as dynamic than static. Hence it is absolutely necessary to be able to determine the pressure and the density with the greatest possible accuracy, especially in the upper strata, which, for the phenomena of circulation, are precisely the most important. For this purpose the pressure should be measured directly, and not merely by approximate methods, like those of Mohn or of Sandström, which are based on static considerations, and yield values that are affected by the experimental errors made in measuring the density and the depth employed in the calculus. For determining the density the best plan is to take the direct measurements on board as soon as possible by means of the hydrometers, since, besides all the objections to the preservation of the samples, the indirect methods tend to superadd the experimental errors due to two direct measurements subject, like all the others, to a source of error, namely, that of the salinity or chloridation or index of refraction, according to the method employed, and those occurring in the construction of the reduction tables (see Thoulet's numerous papers on this point). Moreover, all, or the greater part, of the sources of error which are attributed to the direct determinations are eliminated by using insulated bottles of the type devised by Pettersson and perfected by Nansen,§ slightly and easily modified so as to serve for the measurement of density by the hydrometers of total immersion, the records being made in the bottle itself at the moment the water is fished up, and without being transferred to another recipient. Collecting,

* Sandström und Helland-Hansen, "Ueber die Berechnung von Meeresströmungen," 'Report on Norwegian Fishery and Marine Investigation,' vol. 2, 1902, No. 4.

† Krümmel in a note to "Geographische Studien über das Barents Meer," by Dr. Breitfuss, *Petermanns Mitteilungen*, 1904, No. 2.

‡ A. W. Cronander, 'On the Laws of Movement of Sea-Currents and Rivers.' Norrköping: 1898.

§ Nansen, 'Some Oceanographical Results of the Expedition with the *Michael Sars*. Preliminary Report.

therefore, with such precautions, a great number of values of these fundamental elements, together with the others—temperature, salinity, gas, etc.—which can be useful for the purpose, provided they are strictly comparable, taking into account, also, the conditions of the limiting surfaces, and placing all in relation with the observed currents, it will be possible to detect the general laws of circulation.

Lastly, for marine dynamics, pursuing the study of the tides, which has been most ably treated and well advanced towards its complete scientific acquisition, precisely because for its study we possess a method of continuous observation, it is of the utmost importance to still further investigate wave motion, which lends itself to so many most interesting thalassological and meteorological problems.*

In conclusion, if we want to promote thalassology on thoroughly scientific lines, and thus raise them to the high level of the other kindred sciences, we must, above all, bring to perfection the methods of measurement of the various marine elements which accompany and correspond with the progress made in those sciences of which thalassology makes use.† Hence, in accordance with those methods, our observations have to be made synchronously and with the greatest possible continuity on the well-matured plans adapted to the special conditions of the basins to be studied and of the investigations to be carried out.

THE INDIAN CENSUS REPORT.‡

THE results of the third general census of India occupy a goodly row of over sixty volumes, varying in bulk from the slim publications of Ajmer and Coorg to the veritable "John Trundley" of tomes laid on the statistical altar by Baroda and Mysore. The cream of this mass of literature and figures has been deftly skimmed off by Messrs. Risley, Gait, and Grierson into a couple of moderate-sized volumes full of an interest as varied and comprehensive as is to be found anywhere in this particular field of demography. Those, indeed, who have been steeped in the almost colourless analysis of numbers which is all that convention prescribes for a census in the prosaic West, may be a little perturbed by the oriental profusion which here greets them. It may even be that they will rise from the perusal of this report with a sense that the modicum of solid statistics provided for them has been diluted with a Falstaffian proportion of the sack of ethnological speculation. It is as well, therefore, to bear in mind the oft-repeated warning that India is a geographical expression except in regard to politics, and that the extraordinary diversity of the racial and social elements contained within it renders it impracticable to explain adequately the significance of even the numerical results of a census without recourse to more or less ethnographical detail. Between each enumeration new facts are brought to light or old ones fitted into new places, and in the lower ranks of Indian society, beliefs, customs, and even languages are fading out of existence with astonishing celerity. The Indian census reporter,

* During the revision of proofs I have seen in the *Geographical Journal*, May, 1904, the paper "On the Dimension of Deep-sea Waves, and their Relation to Meteorological and Geographical Conditions," by Vaughan Cornish.

† F. Nansen, 'The Norwegian North Polar Expedition,' 1893–96, Scientific Results, vol. 3, No. ix.; 'The Oceanography of the North Polar Basin,' preface.

‡ 'Census of India, 1901.' Vols. 1, 1a and Appendices. Part i. report; part ii. tables. By H. H. Risley and E. A. Gait. Ethnographic Appendices. By H. H. Risley. Folio. *Maps.* Calcutta: 1903. Cf. also 'General Report of the Census of India, 1901' [Parl. Paper, Cd 2047]. Eyre & Spottiswoode. 1904.

then, should be pardoned if he be occasionally tempted off the dusty high-road of figures for a canter down the shady glades of the jungle of conjecture. It is fairly open to question, however, whether in the case of the report under review, such excursions have not tended to subordinate the facts of the present day to speculative or controversial discussion of origins and evolution. The subjects of these digressions are undoubtedly of the highest interest, and their treatment at the hands of enthusiastic experts like Messrs. Risley and Grierson deserves, and will certainly receive, the most respectful consideration from the recognized authorities on ethnology. At the same time, each author is engaged on special investigations into these subjects, as respectively head of the Ethnographic and Linguistic survey of India, the final fruits of which will be issued in special publications. In these circumstances, except in so far as the correct classification of the census results is concerned, the deeper considerations of ethnology had better, perhaps, have been relegated to the place to which they technically belong, and not been interpolated, in an inchoate form, in a work the primary purport of which is statistical exposition and analysis.

Before entering upon this side of the report, a word of commendation is due to the efficiency of the scheme on which the results of the census were tabulated. By the substitution of the "slip" system of v. Mayr for the old-fashioned method of ticking each item separately on large sheets, not only was a very substantial saving effected in the cost of the operations, but the elaborate combinations of subjects, such as age with occupation and education, caste with civil condition and the like, were greatly facilitated, and the final tables containing this information were prepared with greater speed and accuracy than under the former system. It is only to be hoped that the experience thus gained will embolden the census authorities of this kingdom to modernize their methods.

The report itself opens with an admirable description of the natural divisions of India, according to the classification first suggested by Mr. Blanford and Sir John Eliot, and adopted by the latter for the meteorological work of the Government of India. The scheme is based on the normal rainfall, on a twenty-five years' average, and its seasonal variability, and it is obvious that in dealing with a tropical population like that of India, of which from 60 to 90 per cent. live by cultivation, these considerations are beyond comparison the most essential to the general welfare. The divisions do not in many cases correspond with those of race or language, but, as Mr. Risley points out, complete accord would entail an unwieldy multiplication of their number. Nor, again, is the use of these divisions extended beyond the two leading statistical factors of area and population, because the chief object of the census being administrative utility, its results have necessarily to be set forth by political areas, which have usually little relation to rainfall and little more to orographic demarcation. Taking the table as it stands, one of the features most prominent on its surface is that high density of population accompanies a high and certain rainfall, the exceptions being where the hilly nature of the country restricts the arable area, or where political troubles or widespread unhealthiness have retarded development of the plains and valleys. The first of these opposing influences is very apparent in the figures for the East Satpuras, the second, in those for Assam and Burma. Deducting these three tracts, only one-tenth of the total area enjoys a rainfall above the general average, but this section contains nearly three-tenths of the total population. Another point of interest is the highly irregular distribution of the population, and the consequent want of significance in the mean density-figure for the country as a whole. This question has been examined in detail in the *Journal* of the Royal Statistical Society for December, 1904, where it is shown that 73 per cent. of the area has a density of only 76 per mile, whilst the remaining 27 per

cent. supports no less than 407 on the same unit. The inclusion in the last census of the sparsely peopled tracts of Baluchistan and the Burma frontier hills reduces the mean density of India from 188 (not 163, as is wrongly given in the report) to 170 per mile. From the economical point of view, Baluchistan, the Indian desert, and the Shan hills, with from 4 to 25 inhabitants per mile, may not be thinly populated, considering the scarcity or infertility of the arable land; whilst Lower Burmah, with 25 to the mile, is certainly so, since the Burman, whose industry is not his strong point, manages to export twice as much food-stuff as he raises for his own consumption on a comparatively lightly tilled area; and even in Bengal, with from 450 to 900 per mile, the limits of the expansion of population, though probably nearly approached, have not yet been attained. In a community mainly agricultural, which, as the report shows, is generally averse from migration either to other regions or to other industries, the test of economic density is, to a large extent, the movement of the population—a subject which Mr. Gait has analyzed comprehensively and with great skill. It is pointed out that hitherto, not only famine, but the improvement in accuracy of the enumeration, has prevented the establishment of anything like a normal rate of growth amongst the population of India as a whole. The first general census followed upon severe famine, and suffered, also, from inexperience in the operations; the second bore the marks of ten years of unusual agricultural prosperity; whilst the third, like the first, recorded the effect of periods of severe distress. The general impression made by the analysis of the three enumerations is that even at its best, and in spite of its high birth-rate, the population of the long-settled tracts of India increases at a comparatively slow rate, and it is only in the more recently settled provinces, such as Burmah, that the rate of growth is really rapid. The bulk of the additional burden, it must be remembered, falls upon means of subsistence bounded, elsewhere than in the latter tracts, by natural limitations, and intensive cultivation by which the evil days of congestion are staved off, though gaining ground in some respects, is still far from having penetrated to the core of Indian agriculture. There is, accordingly, a good deal in favour of moderation in the rate of increase. The deplorable set-back of the recent famines, which were of an extent unparalleled for many generations past, is, as might have been expected, the *leit motif* of the greater part of the reporter's comment upon the returns, and colours the statistics of the greater part of the country with its sad tale of loss among the very young and the very old, among the men rather than among the women, among the peasantry and village artisans rather than in the cities and their factories. On the other side of the shield will be seen the record of the amazing recuperative power of the masses, the success with which the State relief measures retained them in their homes and on their land, and their decreasing reluctance to engage in any other but their traditional means of livelihood, when their interests dictate such a transfer of their docile and industrious faculties. J. A. B.

REVIEWS.

EUROPE.

History of Alpine Climbing.

'Josias Simler et les Origines de l'Alpinisme jusqu'en 1600.' Par. W. A. B. Coolidge. Grenoble: Allier Frères. 1904. Pp. xxii., cxcii., 308, 328, and 100. *Price* 25 *fr.*

This important volume will find a place on the shelves of all those who are interested in the story of the Alps. Its author, or rather compiler, Mr. W. A. B.

Coolidge, is well known to all climbers and students of Swiss history as one of the highest living authorities on all matters connected with the history of the Alps, the exploration of their heights and recesses, and the records and literature connected with these subjects.

In the present volume he has reprinted, translated, and annotated the 'De Alpibus Commentarius' of Josias Simler, first published in 1574. This forms the kernel of the work. But in order to make it a complete record of Alpine exploration up to A.D. 1600, Mr. Coolidge has added a number of early documents, some of which are here printed for the first time. Amongst these are the ascent of Mont Ventoux by Petrarch; ascents of the Rochemelon, the Mont Aiguille, of Monte Bo by Leonardo da Vinci; Pilatus, the Stockhorn, and Niesen by Swiss savants. We find also a very curious description of the peaks of the Bernese Oberland written in 1577, and a catalogue of the passes leading into Val d'Aoste known in 1691–4.

In a lengthy introduction the author supplies an historical sketch in which he brings together from various sources details which may serve to throw light on the early condition and knowledge of the Alps. A life of Simler is added. This sketch and the copious notes contain a mass of information on the ancient geography of the Alpine region, and probably no one but Mr. Coolidge could have compiled them so well; certainly, no one living could have brought so large a knowledge, both literary and topographical, to the task.

We trust the book may be reissued in England in a somewhat more convenient form. The bulk of the first edition is, perhaps, exuberant, and the system of pagination seems somewhat intricate. But these trifles will not deter any reader who takes a serious interest in the matter in hand from following Mr. Coolidge's masterly treatment of it.

Italy.

'Italy: a Popular Account of the Country, its People, and its Institutions.' By Prof. W. Deecke. Translated by H. A. Nesbitt, M.A. Swan Sonnenschein. 1904. Pp. xii., 485.

This is a very excellent book of a type rather too rare in English, namely, a general description of a country in all aspects, on the geographical basis. Prof. Deecke deals first with the broad physical characteristics both of the Italian peninsula and of what may be called its appendages, namely, those islands which continue the ridge of the peninsula towards the African coast, and Corsica and Sardinia as forming part of a subsidiary ridge, and the neighbouring seas. He then passes to a detailed consideration of the relief of the whole region—geology, climate, and hydrography, *flora* and *fauna*. Successive chapters deal with the people, its history, industries, and commerce, political institutions, Church, and arts. Finally a detailed topography is given, conveniently divided into sections, from Lombardy to Sicily, the Maltese group, and Sardinia. It is of the external relationship of this section to the rest of the work that criticism may be offered. To arrange the subject-matter of a book of this sort in such a way that no section shall unduly anticipate another must be a difficult matter, and perhaps it was thought well that a close topographical account should be deferred to the end for this reason. But this section is so largely an elaboration of the first section on physical geography as constantly to carry the mind back to it, and perhaps the two might have been more intimately connected. Again, when a work of this kind is set upon a foundation of physical rather than political geography, it is generally well to follow the physical rather than political division throughout. If this be granted in the present case, it is a pity that Corsica has been omitted from the topographical section, whereas Sardinia receives full treatment. The only

apparent reason for this omission is the political reason, but then, again, Prof. Deecke deals with Malta. As regards the book at large, it must always be difficult in a general work to keep strictly within the bounds of intelligibility to the class of reader in view. On this ground the book is almost unexceptionable, but (if only on this ground) a sentence here and there is open to criticism, such as this: "Many of the Alban streams possess marked polar magnetism, apparently induced by that of the earth, though possibly due to lightning;" or this: "Weak traces of ebb and flow are to be recognized in the larger lakes." The main faults of the book, however, are not in its matter, but in its production. They include the use of the German diagrams—always undesirable, and especially so in meteorological maps, for example, where the measurements are metric. In one case the thermometric scale is even left to the imagination. This defect and the occurrence of a careless error in the embossed title on the cover are balanced by some excellent illustrations from photographs. O. J. R. H.

Climate of Vienna and Lower Austria.

'Klimatographie von Niederösterreich.' Von Julius Hann. Herausgegeben von der Direktion der K. K. Zentralanstalt für Meteorologie und Geodynamik. Pp. 104. *With Rainfall Map.*

This volume on the climate of Vienna and Lower Austria, from the pen of Dr. Hann, is the first of a series on the climates of the different crown-lands, and may be taken as typical of the form and method to be followed in later volumes. Lower Austria belongs to a climatic region transitional between the milder types of Western Europe and the severely continental climates found immediately to the eastward, even in Galicia and Hungary. It is crossed by the mean annual isothermal of 50° Fahr., the mean winter isothermals 30° to 34° Fahr., and the mean summer isothermals 68° to 70° Fahr. The mean annual range of temperature at elevations less than 600 feet is 36° to 38° Fahr.; it diminishes with increase of height above sea-level. The average yearly extremes of temperature differ by 72° to 90° Fahr. The mean daily range of temperature is 13° Fahr. for the year, —7°·6 Fahr. in December, and 16°·4 Fahr. in July and August. The most rapid daily changes are due either to sudden thaw after severe frost or to thunderstorms on hot afternoons; a change of 43° Fahr. was experienced on one day in 1850, and of 38° Fahr. in 1902. Tables of departures from the mean values of the fifty years 1851–1900 are given for monthly and yearly temperatures. The coldest winter was that of 1830 (11° Fahr. below mean), and the warmest summer 1811 (5°·8 Fahr. above the mean. The coldest month in Vienna during the last 125 years was December, 1840 (15°·3 Fahr.), and the hottest August, 1807 (7°·7 Fahr.). The coldest year for the whole period was 1829 (44°·2 Fahr.), and the warmest 1797 (52°·5 Fahr.). The average number of days in the year at Vienna without sunshine is seventy-five, of which only four occur in summer. The longest nearly sunless period recorded was from the beginning of December, 1903, to February 6, 1904, with only thirty-one hours' sunshine in seventy days. This occurred with high barometric pressure, calm or light south-easterly winds, and fogs intensified by the smoke of the city. The month of July, 1894, gives the highest sunshine record, with 321 hours.

In the twenty years 1881–1900 the wettest year was 1897, with 115 per cent. of the average, and the driest 1891 (84 per cent.). One-sixth of the annual rainfall in Vienna falls in the form of snow. The number of thunderstorms varies within the wide limits 10 to 31 in the year.

The prevailing wind is from the west; northerly winds are frequent in the early part of the year, and easterly and south-easterly winds in spring and autumn. Southerly winds occur most frequently in October and November.

ASIA.

Ethnological Investigations in Netherlands Borneo.

'Quer durch Borneo: Ergebnisse seiner Reisen in den Jahren 1894, 1896-97, und 1898-1900.' Von Dr. A. W. Nieuwenhuis. Vol. i., with 97 Photographic Plates and 2 Maps. Leiden: E. J. Brill. 1904. *Price* 21*s*.

The present volume deals with Dr. A. W. Nieuwenhuis' journey from Pontianak, on the west coast of Netherlands Borneo, to Samarinda on the east coast, and contains a description of the Bahaus on the Kapuas and Mahakam rivers. A forthcoming volume will give an account of the expedition to the Kĕnyas of the mother-country of the Bahaus, with fuller descriptions of the industry, trade, houses, and art of these people.

In 1893–4 the first expedition was sent out by the Society for the Advancement of Scientific Investigation in the Netherlands Colonies to Central Borneo. This step was taken because it was realized that a furthering of the knowledge of the land and people must also give very important political information. The expedition made large collections of geological, botanical, zoological, and ethnological specimens, and as Dr. Nieuwenhuis was so rarely required to doctor the others, he was free to study the natives by living amongst them.

Formerly the inhabitants of Borneo were classed (1) as Dayak, the original inhabitants, or (2) as Malays, the immigrant people; the former were said to live inland, and the latter on the coast. On the whole this division is correct, but here and there, as in Sarawak, the heathen people occupy the land up to the coast. On the other hand, peoples calling themselves Malays live far in the interior up the great rivers. These two groups of people are never sharply divided, but have greatly intermingled; hence, natives who are nearly, or quite, of pure Dayak origin and belong to a religion which means far more to a heathen Dayak than Mohammedanism, call many places by true Malay or Mohammedan names. One also finds, but possibly more rarely, a Dayak in whose veins Malay blood flows.

In Central Borneo there is a brachycephalic and a dolichocephalic (Indonesian) group. To the former belong the Kayans, and to the latter the Ulu Ajar Dayaks on the Mandai. From an ethnographical point of view, also, the differences between these groups are very marked. The Kayans belong to the great group of Bahau and Kĕnya stocks of East Borneo. Dr. Kohlbrügge argues from the measurements that the Kayans are a mixed people. This is true, as they migrated 150 years ago from their original land of Apu Kayan to the Kapuas, where they mixed with neighbouring races. The Ulu Ajar are considered to be the race which, known as Ot-Danum and Siang, occupy the upper waters of Melawi, Kahayan, and Barito.

In addition to these two large agricultural groups, there are in Central Borneo numerous nomadic hunters, who, under the names of Punan, Bukat, and Beketan, live in the high mountains and at the sources of the great rivers. They appear to be older than the other two groups, and may well be the aboriginal inhabitants of Borneo. Like the Bahaus, the Kenya have for their common mother-land the district, at the sources of the Kayan, or Bulungan, river, which is called Apu Kayan or Po Kedjian.

In this interesting and very beautifully illustrated volume a great deal is given about the beliefs, customs, and handicrafts of the Kayans which it is impossible to particularize. Considerable space and many illustrations are devoted to the interesting and important subject of tattooing, and Dr. Nieuwenhuis gives data whereby the tribe of a person can be told by the designs or patterns tattooed. Those of the women, he points out, are of more reliability than those of the men, as the latter may have travelled and obtained new designs. The author classifies

the tattooing in three groups—(1) Bahau, Kenya, Punan; (2) Bukat, Bĕkĕtan; (3) races from Barito and Mĕlawi and the Ulu Ajar of Mandai. The designs of the first group are in lines. The women decorate the lower arms, hands, ankles, and feet; the men the shoulders, arms, and breast; the thumb of the left hand and the ankles are decorated only on very brave men. The men of the second group tattoo the whole of the body from the lower jaw to the knuckles and ankles with a blue background, so that the patterns are left in the natural skin colour. If a Bukat youth distinguishes himself in war, or in any other way, he is first tattooed on the breast with a triangular figure; later other parts of the body are decorated in regular order according to prowess. The men of the third group begin with discs on the calf; and later, unlike the first group who have isolated figures, the arms, rump, and neck are completely adorned by designs of figures that are joined together. The women chiefly decorate the knees, lower legs, and hands. The second and third groups tattoo free-hand, whilst the first group tattoo by following the impressions of wooden blocks. The third group employ a red colour as well as soot. In the first and second groups the women, and in the third group the men, are the tattooers. There are many taboos connected with tattooing.

The rice-sowing festival frequently does not fall on the same day as the actual sowing. Dr. Nieuwenhuis describes how, at a Mahakam Kayan village, the festive day was appointed by an old priest by the position of the sun in the following way: he had near his house two elongated stones, one large, the other small, and he noted the time at which the sun set at a spot on a certain hill in alignment with the two stones. The rice-sowing festival was the only one which he determined by astronomical means. For the most part the reckoning of time by the Kayans is more or less arbitrary, and depends upon agriculture. The month, or, as they say, the moon, is more important than the year, and hardly any one knows how many moons go to the year.

The natives of the interior of Borneo are a peculiarly pleasant people to visit, with their quiet politeness and self-respecting friendliness. Though they are agriculturalists, they are warlike, a circumstance that is doubtless partly due to the fact that they grow little else but rice, which gives comparatively little trouble and leaves leisure for forays; and partly to the propinquity and extent of the jungle, which enables the men to retain their hunting proclivities and educates them to tackle human game. A very noticeable feature of the non-Malay tribes is their artistic sense, which manifests itself in the pleasing decoration of most of their implements in daily use. This sumptuously illustrated volume can be thoroughly recommended as giving a good insight into the conditions of existence in one of the most interesting spots of the globe, and one, too, that has hitherto escaped the blighting influence of the white man.

A. C. Haddon.

AFRICA.

The Sahara.

Documents Scientifiques de la Mission Saharienne, Mission Foureau-Lamy . . ' Par F. Foureau. Première fasicule: Introduction; Observations Astronomiques et Météorologiques. (Publication de la Société de la Géographie.) Paris: Masson. 1903. Pp. 162.

The "Narrative" of M. Foureau's great journey across the Sahara appeared in his book, 'De l'Alger au Congo par le Tchad' (see *Geographical Journal*, vol. 19, p. 196). The scientific results of the expedition are to be published in six parts—astronomical and meteorological observations; orography, hydrography, and topography; geology; flora and fauna; ethnography; and prehistoric remains. Of

these parts, which will together form a volume of 800 to 1000 pages, and an atlas of 16 maps, the first has been issued, and the others will apparently follow in the order named. The astronomical observations were made by M. Foureau himself, and by M. de Chambrun; they have been reduced and discussed by M. Guyou, President of the Bureau des Longitudes, and give the positions of over a hundred points on the route of the expedition. The results of magnetic observations by M. Foureau are also given.

The meteorological observations consist of readings of aneroid barometer and thermometer thrice daily, observations of hypsometric thermometer at selected points for correction of the aneroid, observations of self-registering thermo-hygrometer, observations of wet and dry bulb thermometers at certain stations, and the usual "eye-observations" of wind, cloud, etc.

For purposes of discussion, the region traversed by the expedition is divided into four climatic zones: (1) the Sahara and Aïr zone, between 32° and 49° N. lat.; (2) Aïr zone, lat. 20° to about 15° N.; (3) Sudan, Tchad, and lower Chari zone, lat. 15° to 12° N.; and (4) sub-equatorial and equatorial zone, lat. 12° N. to the equator, Chari, and Oubangi region. The number of observations in different zones is, of course, differently distributed according to the season during which the expedition found itself in each, but the experiences of the expedition are of peculiar interest, both in affording information about the climatology of an almost unknown region, and in throwing light on the general meteorological *régime* occurring in a type of climate of which we have comparatively little actual knowledge. In the Sahara and Sudan we find a belt extending from the "horse latitudes" to the "doldrums" in a land area of vast extent, but without definite lines of great elevation. The range of temperature is enormous—the expedition records temperatures below freezing twenty-five times, and at the camp at Ouad Affattakha (lat. 25° 16′ N., long. 5° 25′ W., altitude 3753 feet) the thermometer went down to 13°·6 Fahr.; in the Aïr region the mean temperature during June was 99° Fahr., and the daily maximum for May and June never fell below 107° Fahr., nevertheless winds are irregular in distribution and force. Want of vapour-supply prevents the full development of the trade winds, which were not recognized beyond Abellama, in lat. 16° 17′ N., and in the absence of a definite line of elevation the monsoon does not attain strength and coherence. Hence the relative importance of dust-whirls, tornadoes, and similar local phenomena, of which this memoir contains some interesting records, and the characteristic division of the rainfall into defined rainy seasons and accidental showers associated with the local disturbances. The work of the expedition makes a valuable contribution to our knowledge of a typical "continental" climate in the tropics.

A West African Vade-Mecum.

'*Verb. Sap.* on going to West Africa, Northern, Southern Nigeria, and to the Coasts.' By Alan Field, F.R.G.S. London: Bale, Sons, & Danielsson. Price 2*s.* 6*d.*

This little book, of which an advanced copy has been sent us, should be of great use to travellers about to make the acquaintance of West Africa for the first time. It consists of practical hints on outfit, and information on a variety of subjects connected with life and travel in the West African colonies and protectorates, which it is important for the intending visitor to possess, but for which he may search in vain in published works on those countries. Being concerned with one special region, it can, of course, enter into details which the more general scope of the Society's 'Hints on Outfit' would render unsuitable, and it therefore forms a useful supplement to the latter. Chapter II. conveys much practical information in the form of an imaginary voyage from Liverpool to Lokoja, while

other chapters deal with "Health, Climate, and the Seasons," "The Life and Social Amenities," and other subjects.

AMERICA.

The Argentine and Chile.

'The Countries of the King's Award.' By Colonel Sir Thomas Hungerford Holdich. Hurst & Blackett, Ltd. 1904. Pp. xv., 420. *With Map.* *Price* 16*s. net.*

To the author of this book fell the difficult task of evolving from the language of treaties based on a fundamental misconception of the configuration of Patagonia, a boundary between the possessions of the Argentine and Chile, that should form a reasonable settlement of their rival claims. The reader will here find the conditions of the problem clearly set before him, as well as the outlines of the solution which has been so successful in terminating for good the differences which had disturbed the relations of the southern republics.

To the student of political geography, the most instructive chapter will be that in which the author discusses the question of the natural features with reference to which a boundary may be defined, and the terms that should be used in describing them—a chapter which deserves careful study by diplomatists who have to agree upon the course of a frontier in a region whose geographical features are still imperfectly known.

We are given a brief but interesting description of the territories of the two states whose future appears so promising now that the spectre of a protracted and sanguinary war has been happily banished, as well as a sympathetic appreciation of the national characteristics of the inhabitants. The author appears to have been impressed by the efficiency of the naval and military forces of the republics, and devotes some space to the records of the achievements of the navy of Chile in the war with Peru, doing justice at the same time to the heroism of the opposing commander Grau and his comrades. Fortunately, however, the marvellous agricultural development of which the author tells us is of more interest to-day in these southern lands than battleships or armies.

In Patagonia itself the author has had unique opportunities of making himself acquainted with the magnificence of its scenery and the extent of its resources. Both states placed their men-of-war, which on this occasion at least well served the cause of peace, at his disposal, and on land all the resources of the country were drawn upon to facilitate his movements. We have some vivid pictures of his voyage among the intricate channels and fiords of the west coast, whose shores are clothed with exuberant vegetation save where the glaciers from the mountains reach the sea. Then the scene changes to the still grander beauty of Tierra del Fuego, once a synonym for desolation, but which, it now seems, is admirably adapted for sheep-farming.

The chief interest, however, of the book centres in the disputed territory, the succession of fertile and picturesque valleys that have long been hidden away between the Andes on the west and the forbidding pampas of eastern Patagonia. In the deeper hollows lie great lakes that outflow sometimes to the Atlantic, but more frequently through the Andes in deep valleys which are rendered impassable by the close-grown vegetation. The author gives us a graphic description of his extended ride through this region amid the rains of the late autumn, till, on the arrival of winter at last, he turned eastward, and with the snow driven by the tireless western winds at his back, made his way across the pampas to the Atlantic coast. It is difficult to imagine a reader possessed with any vestige of the spirit of travel who does not long to pay a visit to this new wonderland of the southern hemisphere.

The numerous illustrations, which are reproduced from photographs, are excellent. Though they are in most cases printed with the text, the definition is far superior to that of many plates, and wherever the figure of the author appears, however small it may be, the likeness is unmistakable.

J. W. E.

GENERAL.

History of Cartography.

'Kartographische Denkmäler zur Entdeckungsgeschichte von Amerika, Asien, Australien, und Afrika aus dem Besitz der Königlichen öffentlichen Bibliothek zu Dresden.' Herausgegeben von Victor Hantzsch und Ludwig Schmidt. Hiersemann. Leipzig: 1903.

This series of facsimiles includes seventeen excellent illustrations of the map-work of three prominent sixteenth-century draughtsmen, viz. (1) the chart of the Atlantic Ocean basin, by Pero Fernandez, 1528; (2) the 1541 world map of Nicolas Desliens, in three sheets; (3) the extra-European portions of Diego Homem's work of 1568, in thirteen sheets.

As to Pero Fernandez, it is impossible to decide whether this designer is the same as any of the well-known men who bore this name in the great age of Portuguese history; we only know what he tells us on this map—that he executed the present work at Oporto in 1528. But he may have been the same as the Pero Fernandez who in 1558 was commissioned by the King of Portugal (Sebastian) to supply maps and nautical instruments for ships sent to Guinea and India in the service of the state. The original is in MS. Dresd. f. 17; its measurements are 0·88 by 0·64 metre, the height being the larger dimension. The African coast is only shown a little beyond the mouth of the Congo. Great castle pictures mark the fortress of La Mina on the Guinea coast and the capital of the Congo kingdom.

As to Desliens and his work, we do not suffer here from the vagueness that clouds Pero Fernandez. Next to Pierre Desceliers, Nicolas of Dieppe is the leader of that great Norman school of cartography, whose importance was first adequately appreciated by Henry Harrisse; next to the priest of Arques, he is the father of French map-science. The specimens of Desliens here given from the Dresden MS. Geog. A. 52 m. (0·575 metre in height by 1·042 metre in breadth), inscribed *faicte à Dieppe par Nicolas Desliens*, 1541) are claimed by the present editors as earlier than the so-called Harleian map in the British Museum (Add. MSS. 5413), which the late Mr. Coote endeavoured to assign to 1536, considering it as the oldest surviving production of Dieppese cartography. In any case, its resemblance to the Harleian example is most intimate; slighter, but still beyond dispute is its likeness to the "Cabot" map of 1544—a distinctly inferior production of the Dieppe school, but of the Dieppe school nevertheless.

As to Diego Homem, he is probably a son of that Lopo Homem, "mestre de cartas de marear," who received from King Manual, in recognition of his work, a *privilegium*, on February 16, 1517. Diego's life is at present scarcely better known than that of Pero Fernandez. In 1543, after committing murder, he seems to have fled from Portugal to England, and to have remained in exile (in various European countries) till 1547, when he was pardoned and recalled by John III. (July 11). Much of his later life appears to have been spent in North Italy, where Battista Agnese notices his presence, and praises his work as unusually painstaking and finished. Twenty-one maps of his are known. The present work, executed at Venice in 1568, was formerly in the possession of Count Heinrich Brühl, and since 1798 has been in the Dresden Royal Library (MS. Dresd.

f. 59 a). On the third sheet is the endorsement inscription of the author: *Diegus Homē Cosmographus Lusitanus fecit Venettis ano a partu Virginis* 1568.

The works of Pero Fernandez and Diego Homem probably drifted into the possession of the Elector Augustus of Saxony (1553–1586) through the commercial relations cultivated by the latter with Portugal. In 1576 Hieronymus Kramer was sent from Dresden to Lisbon to procure openings for Saxon trade, and in particular to secure direct access to the spice and drug markets controlled by Portugal. Kramer made numerous and valuable purchases for the elector; and in the same way the great Augsburg merchant Konrad Rott, who had temporarily leased from the Portuguese Government the Indian pepper monopoly in Lisbon, and who had met Kramer in Portugal, made himself a commercial and antiquarian agent of the Saxon prince, whose aid he desired in various projects of his own.

The map of Pero Fernandez here given seems to have been noticed in the oldest catalogue of the Electoral collections at Dresden (the 'Inventar der Kunst-Kammer,' drawn up in 1587). We know that before his death in 1586, Augustus had acquired thirteen cosmographical and cartographical works, considered even then as valuable; but the only precise indication of such an acquisition in the records of his life is the present of a compass and sea-chart from Duke John the Elder of Schleswig-Holstein, on March 29, 1575.

As to the details of the map-work here reproduced, we may notice in the Desliens example (plates 2–4 of the present facsimiles) that, as in the "Harleian" map, *Iaua la grande* is prominent and distinctly suggests a discovery of certain parts of the north-west of Australia before this date (1541); that the Caspian is quite misconceived, its length being indicated as from west to east; that the whole of Asia east, north, and north-east of the Caspian is obviously unknown to the designer; and that the Don is really his limit on this side of the world. For though an estuary is indicated in that part of the Caspian shoreland which roughly answers to the Volga delta, there is no hint of a great river, and throughout the eastern and central portions of the present Russian empire, Desliens' conceptions are far inferior to those of Herberstein (1517–1526), just as on the Pacific coast of Asia his delineations are decidedly in arrear of the knowledge already acquired by the Portuguese. In the north-east of North America, Desliens' present work has a striking likeness to the "Cabot" map of 1544, which may be fairly supposed to owe a great deal to Nicolas of Dieppe. In the southern parts of Africa and Asia, and along the shore-lands of Africa, the Norman draughtsman furnishes an excellent picture of the most advanced geographical knowledge of his time.

C. Raymond Beazley.

Geographical Terms.

'Dictionary of Geographical and Topographical Terms.' By Alexander Knox, B.A. London: Stanford. 1904. *Price* 15*s*.

Readers of books of foreign travel are constantly confronted with difficulties in regard to the place-names and topographical terms met with, a right understanding of which involves a greater or less knowledge of a host of out-of-the way languages. Mr. Knox's book is an attempt to remove such difficulties, by the definition of the terms most commonly employed throughout the world for geographical and topographical features, as well as of words in frequent occurrence in the composition of such terms or of place-names. Its interest is therefore obvious at first sight, and, though it lays no claim to completeness, and will be of use rather to the general than to the scientific reader, geographers may still be grateful for the amount of persevering labour bestowed on its compilation, which must have involved difficulties of no light order. Especial attention has evidently been

given to the terms in use in the various African languages (Arabic, Bantu, Somali, etc., etc.), but the various Asiatic groups take likewise a prominent place. Chinese place-names, formed as they are almost entirely from words in ordinary use, benefit in particular from such an explanation of their component parts, though they at the same time offer special difficulties from the impossibility of discriminating, with the English alphabet, between the slight differences of pronunciation which involve entire differences of meaning. Thus what is apparently the same term frequently appears with several distinct meanings. Mr. Knox has, perhaps wisely, made no definite choice between the various systems of transliteration of Chinese, but repeats many of the terms under the different spellings in use (e.g. *kiang* and *chiang*, *chou* and *chau*). It is, perhaps, to be regretted that in such cases he does not specify the parts of the country in which the respective forms are used. The many variants of the first element in the name Sechuan or Suchuan are not entered, though some of them are referred to in the introduction, in which Prof. Keane gives a learned disquisition on the principal consonantal changes which occur in the various groups of languages. Mr. Knox does not devote much attention to precise definition of meaning from the point of view of physical geography, and though by bringing together such a vast number of terms he has simplified the task of future workers in this field, his book still leaves as a desideratum the authoritative list of technical terms in use in geography, the compilation of which has for some time been under consideration by our Society, and has quite recently been taken up in America by Prof. Abbe. Much less attention is avowedly given to European than to extra-European terms, and while many of the former are altogether missing, the definitions of others, *e.g.* "cañon," "scar," "Schollenland," etc., etc., frequently lack scientific precision or completeness. The points of the compass in different languages might also have received fuller attention. But in its own special field the book will be a useful work of reference to the geographer.

THE MONTHLY RECORD.

THE SOCIETY.

Geography in Military Education.—The importance of a thorough study of geography to military officers lately received cordial recognition from Mr. Arnold-Foster, Secretary for War, in a speech which followed the first of a course of lectures on "Military History and Strategy," delivered at the University of London by Colonel H. A. Sawyer on January 16. After expressing his wishes for the success of the enterprise inaugurated on that occasion, and touching upon the general needs of the army as regards education, he said that he should like to see young men come up from the public schools instructed in the great science of geography. Now they come up practically without any knowledge whatever of one of the sciences which, more than any other, was the reasonable foundation for the studies of an officer in the army. He hoped the reorganization of the army might subserve a great purpose in this matter, and that more might be done in the future than had been done in the past to encourage the study of geography. At present it was a special subject in the Staff College, and knowledge

of it was required by the authorities at Sandhurst and Woolwich. But it had been urged on him by many competent authorities with whom he was in agreement that the War Office might encourage the study of geography in the public schools if a reasonable knowledge of the subject were demanded in the preliminary examinations for entrance to the army. There was an extraordinary lack in this country—which of all others ought to be well posted in this branch of science—of a proper knowledge of geography. Such words from one in Mr. Arnold-Forster's position are a happy augury of future success in this direction. In connection with this gratifying statement, we wish to state that in the summary of the correspondence in the *Times*, published in the January number of the *Journal*, we had no intention to endorse all the charges made by the *Times* Military Correspondent. With regard to the Intelligence Department, it is pointed out that it is not a publishing department, and that it is conceivable that, under certain circumstances, the publication of information in the shape of maps or otherwise might be indiscreet and cause breach of neutrality. No reference, moreover, was made to the excellent work done at the Chatham School in training for survey and cartographical work.

EUROPE.

The Vatna Jökull, Iceland.—This great snowfield, the largest in Europe, was crossed last summer for the first time from east to west by Messrs. T. S. Muir and J. H. Wigner. Their equipment was conveyed on two sledges, and ski were found of great service, especially on soft snow. The length of the route was about 80 miles, and excursions on either hand from different camps made up as many more. From Faskrudsfjord, on the east coast, they rode in five days to a point on the north-eastern margin of the Jökull, about 5 miles south of Snaefell. Here they dismissed guides and ponies, and, after a week spent in preparations and reconnoitring, they finally left the northern margin on August 13. They proceeded in a south-westerly direction, until approaching the southern margin, when they turned more to the west to avoid the outliers of the Öraefa Jökull. On the 22nd they crossed the main watershed at a height of about 5000 feet above sea-level. Traversing the magnificent *névé* of the Skeitharar Jökull, they reached on the 26th the crater Graenafjall, situated on the south face of Hágöngur, the second highest measured peak in Iceland. Here they remained encamped in a cave for six days, during which the weather was extremely broken. Hágöngur, however, was climbed, and the fine glacier lake, Graenalón, examined. On September 3 they got off the Jökull near one of the sources of the Djupá. Two days later, after encountering considerable difficulties, they found the farm of Nupstathr, whence, having procured guides and ponies, they travelled to Reykjavik. On the northern margin the upward slope was very gentle, but, in the first instance, the numerous and large surface streams, and later the softness of the snow, made the labour of hauling the sledges very great. In fact, it was only by taking them on one at a time that any progress at all could be made. It was only after the first storm that the new snow made it possible to take both sledges on together. Very soon it was found that the best way was to sleep during the day and travel by night. Then, however, fog proved a great hindrance, making steering extremely difficult. The first crevasses of any size were met with at the head of the Breithamerkr Jökull, near

the southern margin. These were threaded in semi-darkness, and proved merely a welcome change from the monotony of the otherwise featureless snowfield. The whole interior of the Jökull, indeed, is a vast plateau varying in height from 4000 to 5000 feet above sea-level, unbroken except at the edges and near the western margin by a single rock peak. During the last two days considerable trouble was caused by crevasses, which were long and wide, and the route, therefore, was a succession of zigzags. The weather conditions were on the whole as favourable as could be expected. Two snow blizzards were experienced, but those, though causing delay at the time, provided compensation in the covering of new snow, which afforded a better surface for the sledges. The highest temperature recorded was 38°·8, and the lowest 22°·3, the average being about 30°. The prevalence of fog and the ceaseless winds, as well as the marked general humidity of the air, made the cold seem much greater than it really was. As Messrs. Muir and Wigner were alone, and so had to do all the mere manual labour, small leisure remained for purely scientific observation. However, a large number of photographs were taken, and a meteorological record kept. With the aid of pocket-sextant, compass, and sledge odometer (the latter being tested in all conditions of snow), a fairly accurate route survey was made out. The standard map by Thoroddsen, which has deservedly received high praise as regards the rest of the island, could not be expected to be accurate in respect to the Vatna Jökull. It is impossible here to enter into details, but numerous important discrepancies were observed, not only, as was natural, in the unknown northern region, but in the more frequented southern district. Last summer the southern margin was surveyed by a Danish staff, but the northern and western margins would well repay careful and systematic examination, both from a geographical and a geological standpoint, and especially with a view to studying the remarkable volcanic and glacier phenomena.

Age and Origin of the Würm See, Bavaria.—The origin of this lake (called also the Starnberger See) has been attributed by Penck to glacial erosion, a view which has found an opponent in Dr. W. Ule, of Halle-am-Saale. In his work, noticed in the *Journal* a little time back (vol. **19**, p. 381), Dr. Ule gave reasons for doubting Penck's conclusions, and he now claims (*Zeitschrift* of the Berlin Geographical Society, 1904, No. 9) to have found further reason for holding that the lake-basin has not been formed by ice. It consists in the discovery of further evidence of the existence of an old delta covered over with morainic matter at the southern end of the lake, which would show that a lake must have existed here *before* the last glacial period. This fact would also eliminate the difficulty of finding a stream capable of having formed the delta, the old hydrographical system having been greatly changed during the last advance of the ice. Dr. Ule also holds that it is unnecessary to account for the existing hydrographical conditions in this region by supposing (as has been done) a post-glacial movement of the crust, which, he says, is rendered improbable by the fact that the delta alluded to appears to have suffered no disturbance. He concludes by sketching the probable mode of origin of the lake-basin by river-erosion during an early inter-glacial period, followed by deposition of material in the form of a dam during a subsequent advance of the ice.

ASIA.

The Jammu Coalfields.—A comprehensive report, by Mr. R. R. Simpson, on the Jammu coalfields of North-West India, appears in the *Memoirs of the Geological Survey of India*, vol. **32**, part 4. The feasibility of exploring the coal-bearing beds in the Jammu hills had been for some years past under consideration, and the question was recently accentuated through the revival of the project of a railway to

connect Jammu and Srinagar cities. The coal-beds lie between 33° and 33° 11′ N. and 74° 35′ and 75° 13′ E., in Jammu State, and within 35 miles of the Jammu-Punjab boundary. Ladda, the south-easternmost of the coalfields, lies 21 miles north-north-east of Jammu city, the nearest point on the North-West railway. The strike of the coal-bearing rocks cuts obliquely across the hill ranges between 3000 and 9000 feet, with a general east-to-west trend, and the coal outcrops are, as a rule, found in or near the stream-beds. The only made road in Jammu state, 44 miles long, between Jammu and Udhampur, passes within 7 miles of the prospecting drives in Jungle gully. Mr. Simpson's investigation, carried out between March and May, 1903, was not the first that had been made, the region having been the subject of a note in the Records of the Survey (vol. **9**, part 2). In 1901 a Public Works officer instituted prospecting operations, since continued under his supervision, in Ladda coalfields, and different parts of the region have also been explored by others. The only two coalfields possibly workable at a profit are, Mr. Simpson concludes, the Ladda slope, approached through Tikri and Mutal; and the Anji valley, approached through Riassi. Of these two, the former has the advantage that the cost of transport thence to the Tawi would be over 40 per cent. cheaper than from the latter. The output of Ladda collieries, Mr. Simpson would, everything considered, rate as low as 50,000 tons per annum, and he calculates that the coal carried thence by a 2-feet 6-inch gauge railway would sell at Wuzirabad at a loss per ton of R3 2*a*.—an annual loss of 48 per cent. on a capital of 35 lakhs; or, if the line were worked by bullock traction, of rather less than R1—an annual loss of 4 per cent. on a capital of 12¾ lakhs. The Anji valley coal would, he thinks, involve still greater loss per cent. on the necessary outlay, whether an independent line were constructed or merely a branch joining the proposed Jammu-Kashmir line at Talwara. The working of the Jammu coalfields he therefore considers to be, in present circumstances, a proposition not commercially sound.

Winter Journey in Western Sechuan.—M. Bons d'Anty, French consul at Chengtu, briefly describes in *La Géographie* (vol. **10**, p. 317) a winter visit to Mount Omi and the borders of the independent Lolo country, made in company with Dr. Legendre, M. Philippe Berthelot (son of the well-known scientist), and the wife of the latter. The routes do not appear to have led over any ground not previously trodden by Baber, Little, etc., but it is claimed that the ascent of Omi had not previously been made by a European, certainly not by a lady, in winter. The upper half of the mountain was buried in thick snow, with a frozen surface, and only the use of straw sandals enabled the travellers to keep their footing. Only Tibetan pilgrims were met with on the mountain, the winter being the season expressly chosen by them for their pilgrimage to Sechuan. A visit was afterwards paid to a Lolo village on the right (south) bank of the Tung-ho, where these people were found to retain all their primitive characteristics, and impressed the travellers with their frank and hospitable disposition. M. d'Anty says that the proper translation of the name applied to themselves by the Black Lolos is "brown hairs," not "black bones," as it was given by Baber. These are the true Lolos, men of very fine physique, while the race of small stature mingled, and often confused, with them, seems to represent the oldest ethnic element of Indo-China.

Kiau-Chau.—An article by Dr. Berensmann, appearing in the *Zeitschrift für Kolonialpolitik* (Heft **8**, Jahrg. vi.), embodies much information, practical and scientific, about Kiau-Chau and Shantung generally. The mean yearly temperature of Tsing-Tau is shown to be nearly the same as that of Bordeaux. The difference, however, between the monthly means of the coldest and the warmest month, 59° Fahr. at Bordeaux, was at Tsing-Tau, in 1898–99, 75°, and in 1899–1900, 84°. In

1898–99, Kiau-Chau territory had but ten, in 1899–1900, eighteen snowy days. In 1898–99 there were but three days of ice, all in the month of January; and even in the severe winter of 1899–1900 but twenty-four days of ice, twenty of them in January. Kiau-Chau bay is therefore never frozen, though in the severe January of 1900 drift-ice formed on the shallows and at the edge, partially and temporarily interrupting junk communication. Altitude and climatic conditions are comparatively favourable, and in any case better than at Chifu. On the whole Chinese coast Tsing-Tau is considered the most favourably situated, both as a watering-place and a sanatorium, and its visitors from Shanghai, Hong Kong, etc., have lately shown a great increase. Thanks to costly waterworks, the drinking-water is now unexceptionable. Measures of a thorough kind have been taken to cope with fever, cholera, leprosy, etc., and the newly opened hospital has already done much good work. The mountain-tops have, during the past few centuries, been denuded of wood and grass for purposes of combustion; what timber there is is mostly stunted, pine, 3 to 6 feet high, and only on sites unsuitable for tillage, in burial-places and temple groves, are there foliage trees, but these are often of splendid development. The want of timber is a drawback to the working of coal-seams. In German territory a wide area has been laid out in plantations and green crops—over 2000 acres in the vicinity of Tsing-Tau alone. For afforestation the denuded mountains need first to be supplied with soil. With the extension of the forest, birds are increasing in numbers and number of species. Though not one of the overpopulated parts of Shantung, Kiau-Chau has an estimated population of 85,000, or 436 to the square mile. The non-Chinese population lives with few exceptions in Tsing-Tau, where, in September, 1903, there were 928 Europeans (180 women) and 28,144 Chinese (1694 women) against 688 Europeans and 14,905 Chinese in 1902. In the same period, Japanese settlers had increased from 79 to 108. The Chinese of Shantung are men of strong physique, tall and manly build, healthy complexion and intelligent expression, while the Chinese merchant is of "absolute trustworthiness in trading transactions." Many have picked up a knowledge of German. The capabilities of the province as regards agriculture, cattle-rearing, industry, mining, etc., are discussed in detail.

AFRICA.

Survey of the Anglo-German Boundary in East Africa.—Lieut.-Colonel G. E. Smith, R.E., who is now engaged as commissioner in laying down the Anglo-German boundary of the British East African Protectorate between Lake Victoria and Mount Kilimanjaro, has accomplished about half his work, and expects to be back in England in May or June next. Writing from Nairobi on November 22 last, he gives the following particulars of his expedition: "In the first place, it was necessary to transfer the longitude from Kisumu, the railway terminus on Lake Victoria, to the commencement of the boundary, which involved 80 miles of triangulation, besides that of the actual boundary, which is about 230 miles in length. The country between the lake and Kilimanjaro is very little known. Various travellers have crossed it by the Rift-valley, but no one has gone right along it. Burnham's journey from Nairobi to the lake came nearest to it, and Neumann has, I think, crossed from Nguruman, on the big Natron swamp, to the lake.* This country we found inhabited for the first 80 miles or so, but sparcely.

* Neumann's route led north some 60 miles from Nguruman, before striking west for the lake. Another German traveller who has traversed this region is Colonel von Trotha, who in 1896 crossed from Nguruman to Mori bay, on the Victoria lake (*Journal*, vol. 9, p. 90).

By that time we had risen some 6000 feet above sea-level, and had reached an excellent climate, with fine open grass country—some brush, but not very much. Then we descended the Isowria escarpment, which Burnham has named the 'Basalt escarpment,' but I am doubtful whether the rock there is really basalt. This escarpment runs north-east and south-west, and forms the western wall of the Ngare Dabash, or, as it is called when it has crossed the frontier and flows westwards to the lake in German territory, the Mava river. The Dabash is a fine river—in the dry season fordable in places, and some 70 yards broad, but very much larger in the rains. Leaving the Dabash, you have a long rise, diversified with considerable hills, until you reach the neighbourhood of the Rift-valley. The descent from the water-parting (altitude some 7000 feet) is at first gentle, and here also considerable hills break up the country and afford good streams. You reach the escarpment itself somewhat suddenly, and equally suddenly the country changes from open grass-country, with patches of forest, to dense forest clothing the upper slopes of the escarpment, which drops with remarkable abruptness some 3000 feet to the very level floor of the Rift-valley. Nearly the whole of the country described is well watered and affords excellent grazing. The formation is mostly a hard crystalline lava, but in places sandstone and slate appear. Reefs of quartz are frequently met with, and quartzite is common. In places this is of a pure white, and glistens like snow in the sun. So far no gold has been found in this part. Game has been very plentiful. Topi has been by far the commonest antelope, ranging from the lake to the divide before the descent into the Rift-valley. Impalla, zebra, and Jackson's hartebeest are found all over this country. The roan antelope occurs in the neighbourhood of the Ngare Dabash, and gnu (I am afraid I cannot say of what species) from the Dabash to the Rift-valley. The oribi is common at first, but appears to cease east of the Dabash. The wart-hog is numerous nearly all the way along. Rhinoceros are to be found, but judging from the fact that I have seen none, and that only one has been shot, they cannot be very numerous. Elephant's tracks I have noticed occasionally, but I doubt whether they are ever numerous hereabouts. Thomson's gazelle I first saw near the Dabash, and they have been frequently shot right up to and in the Rift-valley. Grant's gazelle I first saw on the divide near the Rift-valley. I do not think they extend further west than that; thence they become common. I have seen what I take to be the gerenuk near the frontier in the Rift-valley, but as I have not got a specimen and know the animal only by description, I am uncertain about it. Oryx (I think *O. Callotis*) I first saw in the Rift-valley. I have a specimen, so that I shall know for certain when at home what it is. The eland is found here, but is not common; a largish herd of twenty or thirty was seen about 70 miles west of the Rift-valley. Buffalo are said to be frequent, but so far only three have been seen and none shot. Giraffe I first saw when nearing the Rift-valley, and again when I entered it."

The Glacial Features of Kilimanjaro.—Prof. C. Uhlig, whose recent investigations on the shores of the Victoria Nyanza we lately referred to, has described before the Berlin Geographical Society his ascent of Kilimanjaro towards the end of 1901, and his study of the glacial features of the great mountain (*Zeitschrift*, No. 9, 1904). The paper is illustrated by a striking series of photographs, and forms a useful supplement to the work of Dr. Hans Meyer. The first ascent of Kibo was made from the east by the route followed by various previous travellers, and thus permitted a comparison of the conditions with those observed by them. At the sleeping-place at 4690 metres (15,400 feet), where snow had been met with by his predecessors, no trace of it was seen by Dr. Uhlig, and it did not begin until some 500 metres higher. At 5600 metres (18,400 feet) the snow took the form of

regular "nieve penitente," exactly analogous to the formation so designated in the Andes, though on a much smaller scale. It had not been previously observed on Kilimanjaro. Dr. Uhlig calls attention to the difference between true "nieve penitente" and the "karren"-like forms of glacier-ice, though he allows that both have their origin in the powerful action of the sun and the approximately vertical direction of its rays under the equator. The action of the wind in creating wave-like surfaces has much influence in the case of the "nieve." The final ascent to the crater was found exceedingly fatiguing, owing to the rarity of the air and the loose nature of the surface. In the crater the accumulation of snow and ice seemed distinctly greater than at the time of Dr. Meyer's visit in 1898, although the time of year (the dry season) would have rendered the converse more likely, and there were no signs of recent snowfall. Dr. Uhlig considered that a period of greater rainfall had, perhaps, set in in East Africa, though it appears that, on revisiting the mountain last year, he noticed a marked diminution in the amount of snow in spite of an unusually rainy season. The photographs give a good idea of the character of the ice within the crater, which in places took the form of vertical needles. Dr. Uhlig afterwards visited the glaciers on the south side of the mountain. He was struck by the difference between these glaciers and those of the temperature zone, a fact due, however, rather to the volcanic nature and consequent form of the mountain than to the latitude. The Kibo glaciers are not hemmed in by steep slopes, but are able to spread out laterally as they descend, and so lack well-defined snouts. The gathering ground is, of course, comparatively small, and Dr. Uhlig was surprised at the number of glaciers to which the *névé* in the crater can give rise. In the ice of the Van der Decken and Heim glaciers he observed distinct blue foliation, and he found support for the idea that this is due to the original stratification of the *névé*. The southern glaciers visited (one of which—the Richter glacier—has to be added to the list of those previously known) possess a common terminal moraine, the water finding its way through by percolation. This moraine falls some 350 feet towards the west, a fact which agrees with the greater extent of glaciation noted by Dr. Meyer in this direction. There were signs of a more or less recent retreat of the ice on this side of the mountain.

Ancient Coast-lines in Algeria.—Among the many localities where past changes in the relative level of land and sea within the Mediterranean basin can be distinctly traced, is the coast of the Sahel in Algeria, where the evidence of such changes has been carefully studied by General de Lamothe, some of whose conclusions are summarized in a note in the *Comptes Rendus* of the Paris Academy of Sciences for December 26 last. M. de Lamothe has proved the existence of seven old shore-lines, at levels varying from 17 to 320 metres (561 to 1050 feet), while there are traces of one still older, at a level of 350 metres (1150 feet). The 320-metre line seems to date from the early Pliocene, since which the coast-line has experienced a series of negative movements, which have lowered it progressively to its present level; and the fact that the successive levels agree with those established at other points on the Algerian coast shows that the successive shore-lines have rested on parallel surfaces. There are indications (*e.g.* the fact that a formation with remains of fluvio-lacustrine origin is seen to plunge beneath the sea) that the movement subsequent to the 15-metre level lowered the shore-line *below* its present level, and was followed by a positive movement. M. de Lamothe draws the following general conclusions, which are of considerable interest to students of the past geography of the Earth's surface: (1) That the regularity of the shore-lines and their agreement in altitude along the whole Algerian coast are an indication that during the Upper Pliocene and the Pleistocene, the Mediterranean was without tides; (2) that the arrangement of the ancient dunes and the

strike of their strata seem to show that the direction of the currents and prevailing winds has not materially changed since the Upper Pliocene; (3) that these facts can hardly be reconciled with the various hypotheses based on supposed periodic or accidental displacements of the axis of the Earth.

Memorial to Clapperton in Sokoto.—Major J. A. Burdon, who has returned to his post as resident of the Sokoto province, Nigeria, has taken out with him a memorial tablet, prepared at his own expense, which will be placed on the Court House at Sokoto, erected by him in 1903. The tablet has the following inscription: "In memory of Hugh Clapperton, Commander R.N., the first European to visit Sokoto, March 16, 1824. He died there April 13, 1827, and was buried at Jungevi." It may be of interest to recall that the first European visitors to Timbuktu were recently commemorated in a similar way by the French authorities, tablets being affixed to the houses in which they had resided (*Journal*, vol. 23, p. 255).

Ruins of the Songhai Capital of Kukiya.—The *Revue Coloniale* issued by the French Colonial Office contains, in the number for September—October, 1904, the announcement of the discovery by Lieut. Desplagnes of the site of Kukiya, the old capital of the Songhai empire, as to the position of which much difference of opinion has prevailed. From a passage in the *Tarikh es Soudan* there was reason to suppose that Kukiya, which was the capital of the empire previous to the establishment of the Askias at Gao, lay at no great distance from the latter, and this has, in fact, proved to be the case. The ruins lie on the east bank of the Niger, about 95 miles south of Gao, opposite the small island on which is the village of Bentia (Binting of Barth), called also even now Kotia-Kokia. The chief of this village is generally acknowledged to be a descendant of the Aksias, and in showing the ruins to the French officer he pointed out numerous Arabic inscriptions as the epitaphs of his ancestors, mentioning also various localities famous in the history of the Aksias as placed in the same neighbourhood. Apart from the tombstones, which still remain standing, the only trace of the old capital consists in shapeless mounds, strewn with fragments of pottery, etc. Lieut. Desplagnes points out the importance of the position of the old city, at the head of the navigable section of the middle Niger, at a point where the river, with its many islands surrounded by foaming rapids, afforded a fit cradle for the hardy founders of the Songhai empire.

The Fulani Emirates of Nigeria: Erratum.—An unfortunate printer's error has reversed the sense obviously intended by Major Burdon to be conveyed in an allusion, in his recent paper, to the native races of Northern Nigeria. On p. 637 of the December number, line 3, "applicable" should, of course, read "*in*applicable."

AMERICA.

Hanging Valleys in Central New York, and Supposed Glacial Erosion.—The position of those who decline to accept the supposed evidences of powerful erosion by ice is certainly not weakened as time goes on. Some weighty arguments against the glacial erosion theory have been put forward in the case of a special region in the United States—that of the Finger lake valleys of Central New York—by Prof. R. S. Tarr, in a paper printed in the *American Geologist* for May of last year, a reprint of which has lately reached us. Prof. Tarr's contribution to the discrediting of the theory is all the more noteworthy from the fact that in an earlier paper on the same region he had himself accepted glacial erosion as the agent to which the present deepened form of the valleys was due, but has been now led to the opposite conclusion by the irresistible logic of facts brought

to light by further study. The main morphological features of the neighbourhood of the Cayuga and Seneca lakes are as follows: The principal valleys form deep trenches (partly occupied by the lakes), while most of the side valleys that debouch into them are of an upland character, and have reached the stage of maturity. But on approaching the main valleys, the gradual slope of their floors comes to an end, and gives place to a steep gradient, while the streams have (since the glacial epoch) cut picturesque gorges through a zone of rock, which presents an otherwise uninterrupted fall to the main valley. The gorges occasionally widen out, owing to the presence of older buried gorges of pre-glacial age. These facts show that the upland valleys have their floors at a considerable elevation above the level of the lakes, and may be termed "hanging" valleys. Prof. Tarr gives many reasons for doubting the view that the main valleys have been "over-deepened" by ice, the principal being that the supposed ice-eroded valleys have the cross-section of gorges; that their sides show many angular precipitous cliffs below the hanging-valley level, with other features which should have been removed by the supposed ice-erosion; and that the observed facts limit such erosion in time to periods when its depth, and hence its effectiveness, would be diminished. Prof. Tarr shows that the existing facts can be well accounted for on the hypothesis of rejuvenation, due to an elevation and tilting of the main valleys.

The Louisiana Purchase.—In the case of a successful colonial venture, it is notable how soon the question of the "hinterland" becomes of capital importance, and how any attempt on the part of foreign powers to go behind its actual limits is acutely resented. The settlement is naturally founded at the coast, whence is communication with the motherland and the world at large. But the worth of the coastal settlement is the worth of the hinterland it taps, and the progress of the coastal settlement keeps pace with the recession of the inland boundary. In ancient times Massilia, and the neighbouring coastal colonies planted by it, implied a domain extending indefinitely backwards into Gaul and Spain. In our own days the whole history of the recent partition of Africa has been one of the acquisition of hinterlands. The hinterland, however, far and away the most magnificent and valuable known in history has been the prize of the American states. To make sure of the hinterland from the Alleghanies to the Mississippi, the colonials, fighting along with the home British, ejected the French (1755–62). But neither could the Mississippi be a definite boundary, but only a base for a further advance west. The United States, of the dimensions they have finally assumed, are due to the Louisiana Purchase, the centenary of which was celebrated last summer at St. Louis. The geography of this larger half is described from various points of view in *Journal of Geography*, Special No. (vol. 3, No. 6). The opening article, from the pen of Prof. Brigham, gives an instructive appreciation of the geographical importance of the purchase. Prof. Brigham shows by analogy that the central artery of the Mississippi could never have formed a boundary, as some have imagined, between two independent states, but was bound sooner or later to serve as a bond of union between the lands on either side. The purchase likewise gave the States the Pacific coast, and with it the gateways that lead out to Alaska, to Hawaii, to Manila, China, and Japan. As to whether the purchase was worth its price, only a figure or two can here be quoted. The wheat production of the Louisiana tract alone in 1900 was more than half that of all the United States. Its corn crop that year amounted to 48 per cent. of the total, the two grains within the area reaching a value of $464,000,000. This says nothing of oats, barley, rye, potatoes, hay, and cotton. In 1900 the purchase area raised more than one-third of the wool of the United States; add sugar and live-stock products, and the census shows that one per cent. of the farm produce for 1900 alone covered the whole

price paid to France for Louisiana. The subjects treated in the monograph include surface and climate, explorations, present industries, irrigation, geographical influences in the development of St. Louis, and several others.

POLAR REGIONS.

Observations on the East Coast of Greenland.—The expedition of Holm in 1883–85 made known the topography of the east coast of Greenland, from Cape Farewell to 66° N. lat., and the Ryder Expedition, 1891–92, explored the neighbourhood of Scoresby sound. With the view of joining up the work in these two regions, the Carlsberg Fund sent expeditions under Lieut. G. C. Amdrup, in 1898-99 and in 1900, to explore the intermediate coastal strip. The first expedition made its winter quarters at Tasiusak, in the Angsmagsalik district, and the records of the observations made, with analyses and discussions, have been published by the Danish Commission for the geographical and geological exploration of Greenland. The report deals first with determinations of position. Lieut. Amdrup fixes the observing station at Tasiusak, 65° 36′ 40″ N. lat. and 37° 33′ 26″ W. long. The second paper in the report, by Mr. V. Willaume-Jantzen, discusses the meteorological observations. These extend over the periods November 1, 1898, to February 22, 1899, and March 23 to May 16, 1899, and are of great value and interest, especially in relation to the passage of cyclones northwards between Greenland and Iceland, and to the *Foehn* phenomena of the region. Lieut. Ravn contributes a paper on observations of the aurora, and Mr. V. Hjort discusses those of terrestrial magnetism.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

A Scheme for the Comparison of Climates.—Mr. W. F. Tyler, looking upon climate as the effect of meteorological conditions on human sensation, points out that of all the factors temperature and humidity are incomparably the most important. With a dry bulb at 77° Fahr. and a wet bulb at 76°, the climatic conditions, as far as Mr. Tyler's sensations are concerned, are similar to those experienced with a dry bulb at 90° and a wet bulb at 79°. He seeks for a measure of this joint temperature and humidity effect, which he terms "hyther," so as to be able to classify climates more precisely than by such terms as "bracing" and "relaxing." He would seek a sensation-scale for hyther similar to the Beaufort wind-scale. To obtain such a scale, he called the hottest, dampest, most enervating day in Shanghai 10; while zero was a brisk, warm, bracing day, one on which, when suitably dressed, no discomfort from temperature and humidity was felt. He induced twelve persons of regular habits to estimate their sensations by this scale every day at noon for a month, while meteorological records were taken by the Rev. Father Froc, S.J., the Director of Zikawei observatory. For summer, the results may be roughly expressed by the following equation:—

$$H = \frac{d - 1{\cdot}2(d - w) - 66}{3}$$

where H = hyther, d = dry-bulb reading, w = wet-bulb reading. The author points out that this is a preliminary result which must not be pushed too far. Probably the zero sensation could never be felt in a saturated atmosphere, and the isohyther lines for winter would have a different direction when plotted in a diagram from those for summer. The author hopes to interest others in hyther determinations, and considers that they would be of special use to the medical profession. There is no doubt that any reliable scale which would indicate the joint effect of temperature and humidity on human sensations and activities would be a great advance in applied climatology, especially in problems of colonization.—*Jour. Balneology and Climatology*, February, 1904.

GENERAL.

Honour to Captain Scott.—Captain Scott has received a gold medal from the Royal Danish Geographical Society, in recognition of his achievement as an Antarctic explorer. The medal bears an effigy of H.M. the King of Denmark.

Dr. J. J. Rein.—The well-known professor of geography at Bonn University, Dr. J. J. Rein, reached his seventieth birthday on January 27 of this year. In order to suitably commemorate Dr. Rein's services to geographical science, both as a traveller and teacher, a fund has been collected, and will be placed at the disposal of Bonn University, the proceeds to be devoted to the furtherance of scientific geography in the form of grants to young geographers to enable them to extend their knowledge by travel. The fund will be known as the "Justus Rein Stiftung." We cordially congratulate the distinguished geographer on this auspicious event.

Congress of French Geographical Societies.—The twenty-sixth session of the National Congress of French Geographical Societies will be held this year at St. Etienne, from the 6th to the 10th or 11th of August. We have received a circular in which a cordial welcome is offered to any members of our Society who may be able to be present. Visits to the principal industries of the region, and excursions, will be organized during and after the meeting. Those who wish to attend should notify their intention at an early date.

The Geographical Association.—The annual meeting of the Geographical Association was held in the Royal Colonial Institute, by permission of the Council, on January 6. The President, Mr. Douglas W. Freshfield, was in the chair. In his address the President called attention to the chief features of the Annual Report, viz. the very satisfactory growth of the Association, which had received 129 new members, and now numbered 448. The most important work carried out in 1904 was the exhibition of maps, models, slides, and other apparatus for teaching geography, which had been on view, not merely in London, but in some of the chief towns in England, Scotland, and Ireland. The association was much indebted to the local authorities, who had been responsible for local arrangements, and more particularly for the way in which they had organized special lectures on the teaching of geography, and given facilities for teachers and pupil-teachers to inspect the exhibits. Another point to which he alluded was the correspondence in the *Times* summarized in the January number of the *Journal*. He again pointed out that the chief barrier to progress in improved geographical teaching was the apathy or opposition of those controlling university and other examinations, and repeated that the first requisite to thinking imperially was to think geographically. Dr. C. R. Dryer, professor of geography in the Indiana State Normal School, then opened a discussion on Practical Geography. He outlined the gradual improvement which was taking place in the position and teaching of geography in America, and insisted on the importance which was now attached to practical work, by which he meant work done with things, not words. In his own classes, the practical work done consisted of the study of land forms, of the atmosphere and of such hydrography as could be carried out in an inland town. In studying land forms, it was necessary to have a small collection of common minerals and rocks, a large number of topographic maps, as many good models as possible (he had about twenty), and many views, both as photographic prints and lantern slides. Half the time nearly was spent on the study of topographic maps, which in the United States showed relief by means of contour-lines. The atmosphere was at all times available for instrumental and practical study. A child who could read a clock could learn to read a thermometer, and it was easy to teach a child to make simple meteorological observations. Each of his students had to keep a three months'

weather record and study the local conditions with reference to the maps and reports of the Weather Bureau, which *were supplied free to any public body agreeing to expose them in some public place.* The numerous lakes gave them examples of shore and wave phenomena, but they were naturally hampered in studying marine conditions 1000 miles from the sea. Field excursions he considered the most important of all. No doubt at first there was opposition, and great discouragement from the helplessness of the ordinary student, who at first could not see anything. That, however, was gradually overcome, and excursions made the geography teaching more vivid and more scientific. Many teachers took part in the discussion which followed. The difficulties of preparatory and public schoolmasters were outlined, and it was stated that until geography was adequately recognized by university and military authorities, it was impossible to secure sufficient time to teach the subject properly. The character more particularly of Government examinations for teachers was held to be responsible for the retention of bad methods. Various suggestions were made as to practical work which could be carried out in schools, such as methods whereby some conception might be given of the units used by geographers, the value of map-reading in the field, with a model and with views, various ways of modelling, exercises with the globe, observations of the sun and of meteorological conditions, the distribution of different kinds of trees, etc.

Practical Geography in Schools.—Those interested in the teaching of geography in schools will find an article in the January number of the *School World* well worthy of their careful consideration. It is the first of a series of articles giving suggestions for practical lessons entitled 'Experimental Geography,' by Mr. A. T. Simmons, B.SC., and Mr. Hugh Richardson, of Brootham School, York. Dealing with geography as any other branch of science, the authors propose to give suggestions for geographical experiments suitable for schools, which can be practically carried out by the pupils under the guidance of a teacher of the more enlightened type, of which the number is, happily, now gradually increasing. In all branches of science experiments are of the utmost importance, and more is often learnt by a few practical demonstrations than by any amount of verbal explanation. Why not adopt this method, wherever possible, in teaching geography? This is what Mr. Simmons and Mr. Richardson very properly recommend should be done; and in the series of articles which they hope to publish in the *School World*, outlines and suggestions for such practical lessons will be given, in the hope that others will adopt the plan and offer suggestions and improvements. The first lesson is entitled "Map-making," and deals with the first conception of maps and map-drawing by directing the pupil to construct a plan of his class-room. From this the area is increased, and he is called upon to make a plan of his school-house, with its surrounding grounds, using a magnetic compass, measuring tape, and sketching-board. A rough traverse is also outlined, and the plane-table is dealt with in an elementary way, and its use practically demonstrated by the pupil being instructed to make a plan of a cricket-field with it. The use of the protractor is described, and base-line measurement, the elements of triangulating with a theodolite, and levelling referred to. This is excellent in its way, and if not altogether original, it is the system of teaching which should be encouraged as much as possible. The difficulty that wil occur to some is the expense of the apparatus, but in reality this is not serious, with the exception of the theodolite, and this, the authors suggest, could be borrowed or hired from some instrument maker. In this there are obvious difficulties, which might, however, be got over, for the principle of the theodolite is so simple that an instrument quite sufficient for school demonstration purposes could be constructed for a very small sum. The system of teaching the pupil to begin with a plan of his immediate surroundings

and then gradually expanding his horizon, is good so far; but he should be taught to take a larger view of the Earth as well. Its position and relative size in the solar system, its actual dimensions and form, the forms and sizes of its great land-masses, are all amongst the subjects which lend themselves to practical demonstration. The globe deserves to occupy a far more conspicuous place in geographical education than it has hitherto done, and then it is quite easy to demonstrate the leading principles of map projection by simple models of the sphere and sections of it, combined with intersecting planes. Maps drawn upon the true curve of the Earth, such as Prof. E. Reclus has advocated so often lately, should also be in general use. Many other suggestions will occur to those desirous of adopting this method of geographical instruction, such as the practical construction by the pupils of clay models on large scales, to show the relief and leading physical features of a country and typical land formation, upon which contours should be drawn. It is to be hoped that the authors of these articles will see their suggestions gradually adopted, as they certainly deserve to be.

The Annual Report of the Russian Geographical Society.—The Annual Report of the Russian Geographical Society for 1903, which has only now reached us, is full, as usual, of interesting matter. A considerable amount of attention was given by the Society to the study of the lakes of the Russian Empire. L. S. Berg explored Lake Balkhash; V. S. Elpatievsky, Lake Kosogol, where he found that the temperature of the water is extremely low, even in summer, while its transparence is greater than in any of the hitherto explored sweet-water lakes; and finally, J. M. Shokalsky explored Lake Ladoga, where very low temperatures, below 4°, were found in the bottom layers. The explorations undertaken in the Tian Shan by V. I. Lipski, in order to complete his work on the flora of Central Asia, and in the range of Peter the Great by V. Th. Novitski, have already been mentioned in the *Journal*. In the same year, J. V. Voronoff explored some of the least known parts of the Sayan range in North-Western Mongolia, and B. B. Grinevetsky the flora of Transcaucasia, along the range which separates the provinces of Erivan and Elisabethpol. The distinctive feature of the vegetation in the mountains of Armenia is the nearly total absence of sub-alpine types and the abundance of xerophyte plants, which reach altitudes up to 10,000 feet and more. The slopes of the range are covered with clumps of the spiny species of *Astragalus* and *Acantholimon*. Only on the eastern slope are the xerophytes less developed, and oak forests are there found in the valleys. Interesting zoological explorations were made by V. A. Faussek in the Transcaspian region, and entomological studies in the Urals by V. E. Petersen. An interesting journey was also accomplished in the great tundra of Archangelsk by P. P. Mataftin; while several students, under the guidance of Prof. D. N. Anuchin, explored some lakes in European Russia and Transcaucasia. Of new expeditions we notice that of Dr. Zarudnyi and the botanist G. G. Gadd to Persia; that of W. L. Sieroszevski for the exploration of the Ainos in Japan; the expedition for recording the words and music of folk-songs in Central Russia having also continued its work. In addition to the three committees, for meteorological work, pendulum observations, and limnology, a new one was founded for the study of the hypsometrical data of the Russian Empire. The following awards of medals (among others) were made in January, 1904. The great Constantine medal was awarded to Friedrich Schmidt, member of the Academy of Sciences, the veteran explorer of both the vegetation and the geology of the Baltic provinces, as well as of Siberia, Sakhalin, and the Arctic tundras, whose work has been prosecuted without interruption for the last fifty years (an excellent sketch of this work, by Prof. Tchernysheff, is embodied in the report); the Count Lütke medal to Sir John Murray, for his well-known work in

oceanography, of which an excellent analysis is given by J. M. Shokalsky; and the Semenoff medal to Prof. N. I. Kuznetsoff, whose botanical exploration in the Caucasus and great work, 'Flora Caucasica Critica,' are epoch-making. The losses of the society during the year 1903 were very heavy. They included Dr. Gustav Radde, who has worked for the society since 1855, first in Eastern Siberia, and later on in the Caucasus; Robert E. Lenz, who did so much in organizing the meteorological polar stations, and wrote, in 1869, an important work on the Amudaria question; Prof. Dokuchaeff, who started the immense work of studying the different soils of Russia, and has created a school of workers who will continue this useful survey; A. P. Engelhardt, the author of valuable works on the province of Archangel; R. N. Savelieff, a geodesist well known to the readers of the *Geographical Journal;* and Baza Menkedjieff, a Kalmuk, who in 1891 made a journey to Lhasa, and wrote a description, which was published by Prof. Pozdnéeff in both Kalmuk and Russian. The report contains also short reports of the different branches of the society, in all of which excellent geographical, limnological, ethnographical, etc., work was done. The discovery of a wide region of glaciers in the Trans-Ili Alatau, by S. Dmitrieff, will be probably the subject of further communications.

OBITUARY.

TWO ARCTIC VETERANS.

Sir Erasmus Ommanney and Sir James Donnet.

By Sir Clements R. Markham, K.C.B.

Two Arctic veterans, Sir Erasmus Ommanney and Sir James Donnet, have passed away at a good old age. Both had reached their ninetieth year.

Born in May, 1814, young Ommanney entered the navy in August, 1826. He was a younger son of Sir Francis Ommanney, the navy agent, and nephew of Captain (afterwards Admiral Sir John) Ommanney, with whom he went to sea in H.M.S. *Albion*. While serving in that ship he was present at the battle of Navarino, in October, 1827, when only thirteen. He became a lieutenant in 1835, and joined the *Cove*, which ship Captain James C. Ross fitted out at Hull for the relief of some whalers caught in the ice. Crozier was the first lieutenant. It was a winter cruise, and there was much buffeting about in severe weather. Ommanney was next flag lieutenant, for three years, to his uncle at Lisbon and in the Mediterranean, and he was for a short time in the *Pique* under Captain Rous, one of the best schools for seamanship.

In 1840 Ommanney was promoted to the rank of commander, and he had the *Vesuvius* in the Mediterranean from 1841 to 1844. With him was an assistant surgeon, James John Louis Donnet, both to serve together in the Arctic Regions in the near future. Donnet was born at Malta, and received part of his education at Paris. He was an accomplished and most amiable officer, and a good French scholar. While in the *Vesuvius* Ommanney became the friend of Captain Horatio T. Austin, the future commander of the Arctic expedition, but then commanding the *Cyclops* in the Syrian war. In November, 1846, Ommanney was promoted to the rank of captain, and was employed by the Government during the Irish famine in carrying out the relief measures. Donnet, meanwhile, served for three years as surgeon of the *Calypso* in the Pacific, where I first made his acquaintance.

In 1845 Erasmus Ommanney became a Fellow of the Royal Geographical Society, and when he died he was second on the list in seniority.

When Captain Austin received the command of the Arctic expedition in 1850, for the search of Sir John Franklin, he selected Captain Ommanney, whom he had known intimately in the Mediterranean, as his second in command. Captain Austin had the *Resolute*, a sailing vessel of 410 tons, and Captain Ommanney the *Assistance*, of 430 tons. Each sailing vessel had a steam tender, the *Pioneer*, under Lieut. Sherard Osborn, for the *Resolute*, and the *Intrepid*, under Lieut. Cater, for the *Assistance*.

This expedition was remarkable for several reasons. It was practically the first expedition in which steam power was used for ice-navigation. It was the expedition which first organized an extensive system of sledge-travelling; while the internal arrangements of the ships were so excellent that perfect health was maintained.

In the *Assistance* Captain Ommanney had McClintock as his first lieutenant, who had already served for a year and a half in the Arctic Regions with Sir James Ross, Lieuts. Elliott and Mecham, Vesey Hamilton, and myself. The surgeons were his old friend Dr. Donnet and Dr. Ede.

Leaving the Thames on May 4, 1850, the four vessels composing the expedition began their voyage to Greenland, and on May 23 Captain Ommanney opened convivial relations with the gun-room by sending us a chit inscribed "At home. Coffee and music at seven." He dined with us on Sundays, and showed a desire to make the ship comfortable from the first, which she certainly was.

After battling with the ice for forty days in Melville bay, the *Assistance* reached Cape York, and communicated with the Arctic Highlanders. Captain Ommanney took one of them on board, a lad of sixteen, who was named Erasmus York. Captain Ommanney afterwards had him educated at Canterbury, and looked after his interests until his melancholy death at St. John's, Newfoundland, in 1855.

On reaching the north water of Baffin's bay, Captain Austin parted company to visit the Eskimos at Pond's bay, while the *Assistance* and *Intrepid* proceeded up Lancaster sound ahead of all the other searching vessels. On Sunday, August 18, when 10 miles inside Cape Warrender, there was the appearance of a cairn on shore. Captain Ommanney went away in a boat, taking me with him, and we discovered a fine harbour. But it was coming on to blow, with a lowering sky, and we were scarcely on board again when half a gale of wind sprang up and sent the *Assistance* up Barrow's strait at the rate of 10 knots. Next day we were off Cape Riley. A cairn was observed on the shore, and a boat was at once sent to examine it. Several vestiges were found of a party belonging to Sir John Franklin's expedition, probably a shooting-party or naturalist's station near their winter quarters. We all thought that the neighbouring Beechey island ought to be searched, but Captain Ommanney, being well ahead of the other ships, and seeing open water, pushed onwards until he was closely beset in Wellington channel. Thus it was that the winter quarters of Sir John Franklin were discovered by the ships coming up behind us.

On September 6 the *Assistance* was very severely nipped near Cape Hotham, being lifted several feet out of the water by the tremendous pressure of the ice. For some hours the ship was in great danger. The other vessels overtook her, and eventually we had to winter in the pack between Griffith and Cornwallis islands. The winter arrangements were admirable, as they were sure to be with such a first lieutenant as McClintock. A newspaper, the *Aurora Borealis*, appeared monthly under the editorship of Dr. Donnet, to which the captain contributed the meteorological records, and there were theatricals, masked balls, and other amusements for officers and men, in which Captain Ommanney took his full share. No happier

nor more united ship ever wintered in the Arctic Regions, and for this result a share of the credit belongs to the captain.

The grand scheme of sledge-travelling, consisting of six extended parties, each with its limited depôt party, and each division with its auxiliary party, was the principal feature of this expedition. The work was organized by McClintock in every detail, in consultation with the captains and other officers. But McClintock deserves the whole credit. Captain Ommanney entered fully into the spirit of the work. He was anxious to do his part. There was no friction. McClintock's journey was by far the greatest that had ever been made in the Arctic Regions, and has never been surpassed except by himself in 1854. Captain Ommanney commanded what was called the Cape Walker division. He discovered the mass of land named after the Prince of Wales, and the great bay which bears his own name. William Dore, a splendid man, who had been with Sir John Richardson, was the captain of his sledge. The captain and his sledge crew were absent from the ship for sixty days, and went over 480 miles of ground. The name of the sledge was the "Reliance," bearing a red flag with a white Maltese cross, and the motto "*Domine dirige nos.*"

Returning to England, the old *Assistance* was paid off on October 10, 1851, after a memorable and exceptionally happy commission. Captain Ommanney contributed to this result, and there never was a truer friend nor a better messmate in every respect than Dr. Donnet. On January 7, 1852, I was the best man at my old messmate's wedding. The *Aurora Borealis* was published by Colburn in a white cover with a golden *Assistance* stamped on it. When I wrote a brief popular narrative of the expedition, entitled 'Franklin's Footsteps,' it was gratifying to me that my father received a cordial letter from Captain Ommanney expressing the satisfaction the little book had afforded him, and pronouncing it to be the most faithful and accurate narrative of the searching operations. "This interesting work," he adds, "must be productive of good feeling towards an expedition to which I trust that all who shared in its labours will look back with satisfaction."

Captain Ommanney's next employment was as senior officer in the White sea during the Russian war, in command of H.M.S. *Eurydice*, and afterwards of H.M.S. *Hawke* in the Baltic. His last employment afloat was the command of H.M.S *Brunswick* in the West Indies, relieving his old shipmate Captain Broadhead, with whom he had served in the *Pique*. Captain Ommanney paid the *Brunswick* off in 1860, and never went to sea again. He received the appointment of Captain Superintendent at Gibraltar.

On November 12, 1864, he obtained flag rank, was created a C.B. for his services in the Russian war, and was knighted for his Arctic service in 1876. He had been elected a Fellow of the Royal Society in 1868. Later in life he received the Grand Cross of the Order of Saviour of Greece for his very youthful services at Navarino. He was on the Council of the Royal Geographical Society from 1872 to 1875, and from 1879 to 1882; and he took a very active interest in the work of the United Service Institution, also serving on its council for many years. He was a Thames conservator. He strongly advocated the renewal of Antarctic exploration, serving on the committees of the British Association appointed with that object.

Sir Erasmus, it is to be feared, was a disappointed man. He never was allowed to hoist his flag, and he felt that his services had not been duly recognized. It was not until two years before his death that he received the Knight Commandership of the Bath. But he took great interest in all geographical work, and was a constant attendant at our meetings and at the British Association. He was President of Section E at Plymouth in 1877.

My old captain was a warm-hearted and sympathetic man, and always ready to help an old shipmate. In 1881 he was interesting himself in the welfare of the family of Mr. Dore, the gunner who had been his sledge captain; and I know that such acts of kindness on his part were frequent. Sir Erasmus died last December, after a long illness, at his son's house at Portsea, and was buried at Mortlake. He would have been ninety-one next May.

Dr. Donnet, after his return from the Arctic expedition, had a very distinguished career in the naval medical service. He was in charge of the naval hospitals at Lisbon, Jamaica, and Haslar, and afterwards enjoyed an honoured old age at his residences at Dover and Bognor. He was a director-general of hospitals and fleets, honorary physician to the King, and a Knight Commander of the Bath. He always kept up a correspondence with his Arctic messmates, and his beautiful handwriting is well known to us all. Sir James Donnet, himself slowly sinking from old age, sent his son-in-law to represent him at the funeral of his old friend and shipmate, Sir Erasmus Ommanney. He died last January.

The officers of the old *Assistance* were remarkable for their longevity. Last year six were alive out of eleven. Sir Erasmus Ommanney and Sir James Donnet reached their ninetieth years. Four still survive—Sir Leopold McClintock, Sir Vesey Hamilton, Dr. Ede, and myself. We number one Grand Cross and three Commanders of the Bath, three Fellows of the Royal Society, five of the Royal Geographical Society. The old *Assistance* was a happy and a distinguished ship.

Colonel C. E. Stewart, C.B., C.M.G., C.I.E.

The death occurred on December 26, 1904, of Colonel C. E. Stewart, an old and valued member of the R.G.S., on whose Council he had served in 1886–87. Colonel Stewart, who was born in 1836, was son of the late Mr. Algernon Stewart and grandson of the seventh Earl of Galloway. He entered the Indian army in 1854, and served with distinction during the Indian Mutiny, receiving a medal for his services. After serving in two other Indian campaigns, and reaching the rank of lieut.-colonel in 1879, he was employed on political service in Persia for some years, during which he was able to do some useful geographical work, the results of which were contributed from time to time to the *Proceedings* of the Society. In 1881 he read a paper on "The Country of the Tekke Turkomans," which appeared in the *Proceedings* for September of that year, accompanied by a map based largely on his own surveys. Some four years later he again read a paper, this time on his work on the Perso-Afghan frontier, where he had been employed by Government on special duty. One of his most interesting and hazardous journeys at this time was his crossing of the Lut, or desert of Eastern Persia, which had only once before been accomplished by a European since Marco Polo's time, and which he carried out at the most trying season of the year, suffering much from want of water during the passage. Having been made colonel in 1883 and C.B. in 1886, he became consul successively at Resht, Tabriz, and Odessa, finally retiring in 1899. Colonel Stewart was married in 1869, and leaves two sons, the elder being Captain A. B. A. Stewart, D.S.O., Seaforth Highlanders.

Edward John Payne.

It is with deep regret that we record the death, which occurred on December 26, 1904, from drowning in the canal at Wendover, of Mr. E. J. Payne, the well-known writer on historical and geographical subjects. Mr. Payne was the son of Mr. E.

W. Payne, of High Wycombe, and was born in 1844. He was educated at High Wycombe Grammar School, and at Oxford, where, after graduating with first-class honours in the Classical School in 1871, he was elected a Fellow of University College. In 1874 he was called to the Bar, and in 1883 became Recorder of High Wycombe. For a number of years he had devoted himself to the study of history, especially that of America, and of European colonization and discovery in general. The first volume of his important work on the 'History of the New World called America' was issued by the Clarendon Press in 1892, a second in 1899, and he continued up to his death the preparation of material for further volumes. To the 'Cambridge Modern History' he contributed two striking chapters on 'The Age of Discovery' and on 'The New World;' and among his other works were a 'History of European Colonies' (1877); two volumes of extracts from Hakluyt, relating to Elizabethan voyages to America; and a volume on 'Colonies and Colonial Federations' (only just completed before his death) in the English Citizen series. He was also engaged on other works, including an edition of 'Sir Francis Drake revived' for the Hakluyt Society, of whose council he was a valued member. Mr. Payne's loss will be keenly felt by all who knew him, to whom his genial and kindly disposition could not fail to endear him. He had joined our Society in 1886.

Captain Claud Alexander.

News, we regret to say, has been received from the Niger of the death from enteric fever, on November 30, of Captain Claud Alexander, who, in association with his brother, Lieut. Boyd Alexander, was doing such good work in the survey of some of the least-known parts of Northern Nigeria (see *ante*, p. 176, and vol. 24, p. 589). Captain Alexander was the youngest son of Lieut.-Colonel B. F. Alexander, of Cranbrook, Kent. Entering the army, he served with the Scots Guards throughout the South African war, being wounded at Belmont, and mentioned by Lord Methuen for gallant conduct in that engagement. He received two medals for his services in the war. Before setting out with his brother for Nigeria, he had taken much pains to qualify himself for survey work, and received the diploma of the Society after passing through a course of instruction. His labours during the present expedition had involved many difficulties and hardships, owing in part to the famine prevalent in various parts of the country; but he had shown great perseverance, and had already achieved valuable results. African geography has therefore suffered a severe loss by his untimely death at the early age of twenty-six years.

Charles H. Allen.

The veteran worker for the abolition of slavery, Mr. Charles H. Allen, died at Hampstead on December 19, 1904, at the advanced age of eighty years. Mr. Allen belonged to a Quaker family, well known for philanthropic sympathies, and in his early years travelled considerably in various parts of the world. In 1879 he became secretary of the British and Foreign Anti-slavery Society, a post which he held for nineteen years, throwing himself into the cause with immense energy and determination, and to his efforts was largely due the organization of the International Anti-slavery Conference, which met at Brussels in 1889. He had been a Fellow of our Society since 1864.

CORRESPONDENCE.

Philological Results of the British Occupation of the Island of Minorca.

Inquiries made during several visits I have paid to the Balearic islands have led to the discovery of the following philological results of the British occupation of Minorca.

As is well known, the island was occupied on three occasions by British troops. The first occupation lasted from 1712 until 1756; the second from 1763 until 1781; and the third and last from 1798 until 1802, when the island was finally restored to Spain, in accordance with the provisions of the Treaty of Amiens. Since that time there has been practically no communication with Great Britain, nor with any English-speaking country, other than that carried on by occasional visits of warships.

It is, therefore, interesting to find that, after the lapse of a century, the following English words are still in general use. I append them with the local orthography. Of course, the pronunciation has been considerably modified.

Stirrup, *mug*, *shoemaker*, *chalk*, *boy*, *screw*, *rule*, *gin*, *midshipman*, *bottle*, *shake hands*, *haversack*, *razor*, *lath*, *clog*, *marbles*, *kettle*, *sideboard*, *plenty*, *lazy*, *beggar*.

Recess means retirement or retreat.

Halloo, an exclamation used to make fun of any one.

Strop, the piece of leather or cloth used to keep the oar in the rowlock.

Stick, billiard cue.

Jack, jack-plane.

Play, the game of fives.

Stop, please, terms applied to the game of marbles.

Cap, night-cap.

Blackball, blacking for cleaning boots.

Black varnish, tar.

Set hammer, a kind of hammer used for polishing metal.

In. In playing marbles, when the marble goes into the hole, the player says, "In."

Out. When the marble goes out of the hole, the player says, "Out."

Pink, *kiss*, terms applied to the game of quoits.

Quick, term applied to the game of hide-and-seek.

Ox is the word used by farmers to call black cattle.

The most popular British governor was undoubtedly Sir Richard Kane, who died in the island in 1736. His memory was perpetuated by a small obelisk, now almost hidden by a causeway which has been built in recent years. This, and the barracks at San Felipe, are the only remaining monuments of the British occupation.

Numerous words with the affix *Kane* are still in general use, of which perhaps the most common is the fruit called *Peras de Kane*.

Frederick Sternberg.

42, Calthorpe Road, Edgbaston, Birmingham.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1904–1905.

Fourth Meeting, *January* 9, 1905.—Sir Clements Markham, K.C.B., in the Chair.

Elections.—*James Brandis-Dunbar*; *Lieut. Virgoe Buckland, R.N.R.*; *Neville Baldwin Chichester*; *Ernest W. Dann, B.A.*; *Kenneth Douglas Field*; *Lieut. C.*

R. Bacon Habell, R.N.R. (*Charting Officer, South Nigeria, W. Africa*); *Robert Hamer Hampson, LL.D., M.A.*; *J. L. Holland, B.A.*; *George Hopkins*; *Robert Collyer Jones*; *Maurice Simeon McKay, B.A.*; *J. F. Marshall*; *Penry Vaughan Morgan*; *Edward Gerald James Moyna*; *J. Owen-Jones*; *G. W. Palmer*; *Rt. Hon. Sir Joseph West Ridgeway, P.C., K.C.B., G.C.M.G., K.C.S.I.*; *Frank Rushby*; *Herbert Sharp*; *Jas. Hubert West Sheane, B.A.*; *Reginald John Smith, K.C.*; *Captain Hugh O. Swanston* (*3rd York and Lancaster Regiment*); *Rev. Frederick Herbert Taylor, B.A.*; *Reginald Charles Newton Twite.*

The paper read was:—

"Mr. Reginald Enock's Journeys in Peru." By the President.

LECTURE TO YOUNG PEOPLE.

Friday, January 6, 1905, *at* 3.30 *p.m.*

"On the National Antarctic Expedition." By Captain R. F. Scott, C.V.O., R.N.

Fifth Meeting, January 23, 1905.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Captain C. R. H. Bacon* (*1st King's African Rifles*); *Frederick Hugh Capron*; *Captain Boyd Alexander Cuninghame* (*Hon. Captain 4th A. and S. Highlanders*); *Thomas Luther Evans*; *John Finch*; *David Peter de Villiers Graaff*; *Melville Hilton-Simpson*; *Captain Richard Percy Jones, R.F.A.*; *Ernest Romney Matthews, C.E., F.G.S., F.R.S.E.*; *Henry William Morrison*; *Rev. Theodore Tracey Norgate*; *Samuel Turner*; *Benjamin Whiteside.*

The Paper read was:—

"The Great Zimbabwe and other Ancient Ruins in Rhodesia." By Richard N. Hall, Esq.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Hungary—Lakes. *Math. u. Naturw. Berichte Ungarn* **19** (1901): 51–54. **Kalecsinszky.**

Ueber die ungarischen warmen und heissen Kochsalzseen als natürliche Wärmeakkumulatoren, sowie über die Herstellung von warmen Salzseen und Wärmeakkumulatoren. Von A. v. Kalecsinzky.

Iceland. **Guðmundsson.**

Island am Beginn des 20. Jahrhunderts. Von V. Guðmundsson. Aus dem Dänischen von R. Palleske. Kattowitz in Schlesien: Gebrüder Böhm, 1904. Size 10 × 6½, pp. xvi. and 234. *Illustrations. Price* 6*s.*

An interesting sketch of Icelandic life and activities at the present day, with a chapter on the physical features of the country. Apart from this, the chapter which most concerns the geographer is that on the bases and conditions of practical life, which treats of trade, industries, communications, etc.

Italy—Strait of Messina. **Platania.**

G. Platania. I cavi telegrafici e le correnti sottomarine nello Stretto di Messina. (Rivista Marittima, estratto dai fasc. di agosto-sett. 1904.) Città di Castello, 1904. Size 9 × 6½, pp. 36. *Presented by the Author.*

Spain—Pyrenees. *Rev. G.* **28** (1904): 270–278. **Briet.**

La garganta d'Escoain. Par L. Briet. *With Map and Illustrations.*

Sweden—Lakes. **Grenander.**

Les variations annuelles de la température dans les lacs suédois. Par S. Grenander. (Reprinted from Bull. of the Geol. Instit. of Uppsala, vol. vi. part i.) Uppsala, 1904. Size 10 × 6½, pp. 160–168. *Diagrams.*

Turkey—Albania. *Deutsch. Rundschau G.* **26** (1904): 558–562. **[Steinmetz.]**

Durch de Hochländergaue Oberalbaniens. *With Map and Illustrations.*

Résumé of a brochure by Herr Steinmetz.

United Kingdom—England and Wales. **De Salis.**

Bradshaw's Canals and Navigable Rivers of England and Wales. A Handbook of Inland Navigation for Manufacturers, Merchants, Traders, and others. Compiled, after a Personal Survey of the whole of the Waterways, by H. R. De Salis. London: H. Blacklock & Co., 1904. Size 10 × 6½, pp. 480. *Map. Price* 21*s. Presented by the Publishers.*

This supplies for the first time a comprehensive handbook to the inland navigation of England and Wales, which will be indispensable to all students of the subject. It gives full statistics, and the information has been checked by a personal survey of the waterways, which are clearly shown in blue on the accompanying map.

United Kingdom—Geological Survey. ——

Memoirs of the Geological Survey. Summary of Progress of the Geological Survey of the United Kingdom and Museum of Practical Geology for 1903. London: E. Stanford, 1904. Size 10 × 6½, pp. 196. *Maps and Sections. Price* 1*s. Presented by the Geological Survey.*

United Kingdom—Hertfordshire. **Skeat.**

The Place-Names of Hertfordshire. By the Rev. Prof. Skeat. Hertford. Printed for the East Herts Archæological Society, 1904. Size 9 × 6, pp. 76. *Price* 3*s.* 6*d.*

Prof. Skeat here extends to Hertfordshire his valuable studies of place-names on a philological basis, of which a previous outcome was a similar volume on the Cambridgeshire names (1900).

United Kingdom—Ireland—Historical. **Falkiner.**

Illustrations of Irish History and Topography, mainly of the Seventeenth Century. By C. L. Falkiner. London: Longmans & Co., 1904. Size 9 × 6, pp. xx. and 434. *Map and Plans. Price* 18*s. net. Presented by the Publishers.*

The chapter with most bearing on geography is that on the counties of Ireland, their origin, constitution, and gradual delimitation, which had already been printed elsewhere, and noticed in the *Journal* (vol. 23, p. 781). Other sections deserving notice are, that on the woods of Ireland, and the reprints of contemporary accounts of Ireland in the seventeenth century, which are of interest as throwing light on the changes which have since taken place. They include the Irish section of Fynes Moryson's 'Itinerary,' and some others less generally accessible, such as the travels of Sir W. Brereton (1635), and M. Jouvin or Jorevin's description of 1672.

United Kingdom—London. **Baedeker.**

London and its Environs. Handbook for Travellers by Karl Baedeker. Fourteenth

edition. Leipzig: K. Baedeker; London: Dulau & Co. 1905. Size 6½ × 4½, pp. x., 472, and 44. *Maps and Plans. Price* 6*m. Presented by Messrs. Dulau & Co.*

The information in this edition is brought down to October, 1904.

United Kingdom—Scotland. **Rickmers.**

Aquatic Sport on Ben Nevis. By W. R. Rickmers. (Reprinted from the *Scottish Mountaineering Club Journal.*) Size 8½ × 5½, pp. 10. *Illustrations. Presented by the Author.*

An account of skiing experiences in Scotland. The writer points out that local forms of ski have been in use in the British Isles for generations.

United Kingdom—Yorkshire. *Geolog. Mag.* **1** (1904): 544–551. **Carter.**

River Capture in the Don System. By the Rev. W. L. Carter.

The Glaciation of the Don and Dearne Valleys. By the same.

ASIA.

Central Asia—Tian Shan. *Petermanns M.* **50** (1904): 272–273. **Friederichsen.**

Peneplain-Bildungen im zentralen Tiën-schan? Von Dr. M. Friederichsen.

Central Asia—Tian Shan. **Merzbacher.**

Petermanns M. Ergänzungsheft No. **149** (1904): pp. 100.

Vorläufiger Bericht über eine in den Jahren 1902 und 1903 ausgeführte Forschungsreise in den zentralen Tian-Schan. Von Dr. G. Merzbacher. *With Map and Panoramas.*

Chinese Empire—Tibet. *J.G. Tōkyō G.S.* **16** (1904): 193–194. **Ogawa.**

Yasuteru Narita's Travel to Lhassa. By T. Ogawa. [In Japanese.]

Chinese Empire—Tibet. **Sandberg.**

The Exploration of Tibet: its History and Particulars from 1623 to 1904. By G. Sandberg. Calcutta: Thacker, Spink & Co.; London: W. Thacker & Co. 1904. Size 9 × 5½, pp. vi. and 324. *Map and Plan. Presented by the Author.*

A useful and carefully carried out compilation. The map is somewhat roughly drawn, and shows only the main outlines of Tibetan geography.

French Indo-China—Tongking. *B.G. Hist. et Descriptive* (1903): 421–497. **Girard.**

Les tribus sauvages du Haut-Tonkin. Mans et Méos, notes anthropométriques et ethnographiques. Par Dr. H. Girard. *With Map and Plates.*

India—Population. *Quarterly J.R. Meteorolog. S.* **30** (1904): 273–285. **Dallas.**

The Variation of the Population of India compared with the Variation of Rainfall in the decennium 1891–1901. By W. L. Dallas. *With Maps.*

Japan. *P.R. Philosoph. S. Glasgow* **35** (1903–1904): 289–300. **Fukuzawa.**

The Future of Japan from the Geographical Point of View. By Sampachi Fukuzawa.

Japan. *J.G., Tōkyō G.S.* **15** (1903): 631–636; **16** (1904): 28–31. **Tanaka.**

Limnological Researches in Environs of the Bandai-san. By A. Tanaka. [In Japanese.]

Japan—Trade. **Hatton.**

The Foreign Commerce of Japan since the Restoration, 1869–1900. By Y. Hatton. (Johns Hopkins University Studies, Series xxii. Nos. 9–10.) Baltimore, 1904. Size 9½ × 6, pp. 80. *Diagrams.*

Japan—Volcanoes. *J.G., Tōkyō G.S.* **15** (1903): 813–818. **Otsuki.**

Volcanoes of North Japan. By Yōnosuke Ōtsuki. [In Japanese.]

Malay Archipelago—Borneo. **Beccari.**

Wanderings in the Great Forests of Borneo. Travels and Researches of a Naturalist in Sarawak. By O. Beccari. Translated by Dr. E. H. Giglioli, and revised and edited by Dr. F. H. H. Guillemard. London: A. Constable & Co., 1904. Size 9 × 6, pp. xxiv. and 424. *Maps and Illustrations. Price* 16*s. net. Presented by the Publishers.*

The Italian original was reviewed in the *Journal* for October, 1902 (vol. **20**, p. 443).

Persia. **De Morgan and Huart.**

Mission Scientifique en Perse. Par J. de Morgan. Tome v. Études linguistiques. Deuxième Partie. Textes Mandaïtes publiés par J. de Morgan. Avec une

Notice sur les Mandéens. Par C. Huart. Paris: E. Leroux, 1904. Size 11½ × 9, pp. xiv. and 286. *Plates.* *Price* 40 *fr.*

South-East Asia. Heger.

Alte Metalltrommeln aus Südost-Asien. Mit Unterstützung der Gesellschaft zur Förderung Deutscher Wissenschaft, Kunst und Literatur in Böhmen, herausgegeben von Franz Heger. Text and Plates. Leipzig: K. W. Hiersemann, 1902. Size 15 × 11½, pp. 248. *Presented by the Author.*

Turkey—Asia Minor. *Globus* **86** (1904): 129–133. Janke.

Das Schlachtfeld am Granikus. Von Oberst A. Janke. *With Map and Illustrations.*

AFRICA.

Africa—Historical. Vollkommer.

Die Quellen Bourguignon d'Anvilles für seine Kritische Karte von Africa. Von Dr. M. Vollkommer. (Münchener Geographische Studien, herausgegeben von S. Günther. Sechzehntes Stück.) München: T. Ackermann, 1904. Size 9½ × 6, pp. 124. *Price* 2*s.* 6*d.*

This will be specially noticed.

Angola. *Z. Kolonialpolitik* **6** (1904): 743–748. Singelmann.

Von Mossamedes zum Kunene. Von C. Singelmann.

Central Africa. Pierre.

De Brazzaville au Caire par l'Oubangui et le Bahr-el-Ghazal (1903–1904). Par C. Pierre. (Extrait du *Bulletin de la Société de Géographie Commerciale*, No. 3, Année 1904.) Paris, 1904. Size 9 × 5½, pp. 24. *Map.* *Presented by the Author.*

Central Sudan. *C. Rd.* **139** (1904): 378–379. Hubert.

Sur les roches éruptives rapportées par la mission Niger-Bénoué-Tchad. Note de H. Hubert.

Congo State. Fuchs.

Congo Free State. Report of the Vice-Governor General to the Secretary of State. (Extract from *Bulletin Officiel*, No. 7, July, 1904.) Brussels: J. Lebègne & Co. Size 9 × 6, pp. 96.

Dahome. *La G., B.S.G. Paris* **10** (1904): 267–286. Drot.

Notes sur le haut Dahomey. Par — Drot. *With Maps.*

Dahome—Borgu. *La G., B.S.G. Paris* **10** (1904): 145–160. Brousseau.

Le Borgou. Par G. Brousseau. *With Map.*

East Africa. *Jahresb. G.-Ethnog. Ges. Zürich* (1903–1904): 39–67. Kollbrunner.

Die Eisenbahn von Djibouti nach Harar. Von U. Kollbrunner. *With Map and Illustrations.*

Egypt. Wessely.

Topographie des Faijûm (Arsinoites Nomus) in griechischer Zeit. Von Dr. K. Wessely. (Denkschriften der K. Akademie der Wissenschaften in Wien. Philosophisch-historische Klasse. Band L. i.) Wien: C. Gerold's Sohn, 1904. Size 12½ × 10, pp. 182. *Maps.* *Price* 11*s.*

Egypt—Agriculture. *Scottish G. Mag.* **20** (1904): 561–568. Joannides.

Egyptian Agriculture, with special reference to Irrigation. By P. N. Joannides.

Egyptian Sudan. *J. Anthrop. I.* **34** (1904): 149–166. Cummins.

Sub-tribes of the Bahr-el-Ghazal Dinkas. By Captain S. L. Cummins. *With Illustrations.*

German South-West Africa. *G.Z.* **10** (1904): 507–513. Dove.

Die geographische Eigenart des Aufstandsgebietes in Südwest-Afrika. Von K. Dove.

Kamerun. *Deutsch. Kolonialblatt* **15** (1904): 587–591, 610–613. Hirtler.

Bericht des Oberleutnants Hirtler über eine Erkundungsexpedition von Bamum nach Jabassi.

Kamerun. *Z. Kolonialpolitik* **6** (1904): 539–552. Kürchhoff.

Binnenwasserstrassen in Kamerun. Von D. Kürchhoff.

Kamerun. **Puttkamer.**
Deutsch. Kolonialblatt **15** (1904): 80–82, 121–123, 186–188, 321–323.
Bericht des Kaiserlichen Gouverneurs v. Puttkamer über seine Reise in das Tschadseegebiet.

Lake Chad. *Z. Kolonialpolitik* **6** (1904): 522–538. **Kannengiesser.**
Der Tsâde oder Tsâdsee. Von G. A. Kannengiesser.

Madagascar. *J. Asiatique* **3** (1904): 489–509. **Ferrand.**
Madagascar et les îles Uâq-Uâq. Par G. Ferrand.
The writer derives the Wak-wak of the old Arab writers from one or other of two Malagasy words (see *ante*, p. 98).

Morocco. *B.S.G. Cher* **2** (1903–1904): 247–253. **Attanoux.**
Le Maroc, Politique, Économique et Pittoresque par le Comte J. B. d'Attanoux. (Compte rendu par J. Machat.) *With Map and Illustrations.*

Morocco. *Questions Dipl. et Colon.* **18** (1904): 465–473. **Franklin.**
L'accord franco-espagnol au sujet du Maroc. Par J. H. Franklin.

Sahara. *B.G. Hist. et Descriptive* (1903): 498–526. **Flamand.**
Note sur les inscriptions et dessins rupestres de la Gara des Chorfa du district de l'Aoulef (Tidikelt; Archipel Touatien) recueillies par M. le Commandant Deleuze (1901–1902). Par G. B. M. Flamand. *With Illustrations.*

Sahara. *La G., B.S.G. Paris* **10** (1904): 81–84. **Villatte.**
Le raid du Commandant Laperrine à travers le Sahara. Lettre de M. Villatte. *With Map.*
See note in the *Journal* for October last (p. 481).

Sierra Leone. *J. Manchester G.S.* **19** (1903): 155–166. **Smith.**
Some account of the Colony and Hinterland of Sierra Leone. By the Rev. Canon F. C. Smith. *With Illustrations.*

Swaziland. *B.S.G. Lisboa* **22** (1904): 222–241, 265–282. **Lima.**
O caminho de ferro da Swazilandia. Por A. A. Lisboa de Lima. *With Map.*

Togo. *Globus* **86** (1904): 283–286. ———
Die Festlegung der Westgrenze von Togo. *With Map.*

Transvaal. ———
Geological Survey of the Transvaal. Report for the year 1903. Pretoria, 1904. Size 13½ × 8½, pp. 48. *Maps and Illustrations. Presented by the Geological Survey of the Transvaal.*

Tripoli. *B.S.G. Com. Havre* **21** (1904): 13–35. **Mathuisieulx.**
Voyage en Tripolitaine en 1903. Par le Vicomte de Mathuisieulx.
This journey was briefly described in the *Journal* for December, 1903 (p. 700).

Tripoli. *B.S.G. Lille* **42** (1904): 79–101. **Mathuisieulx.**
Voyage en Tripolitaine. Par M. le Vicomte de Mathuisieulx.

Tropical Africa—Meteorology. ———
Meteorological Office. Climatological Observations at Colonial and Foreign Stations. I.—Tropical Africa, 1900–1901–1902. Tables prepared by E. G. Ravenstein. London: Eyre & Spottiswoode, 1904. Size 12½ × 10, pp. 54. *Map. Price 6s. Presented by the Meteorological Office.*
Students of African climatology will be glad to know that the publication of results of observations in Tropical Africa, inaugurated by the British Association Committee of which Mr. Ravenstein was chairman, is being continued under the Meteorological Office.

Tunis. *B.G. Hist. et Descriptive* (1904): 33–68. **Hamy.**
Cités et nécropoles berbères de l'Enfida (Tunisie moyenne). Étude ethnographique et archéologique. Par E. T. Hamy. *With Maps and Illustrations.*

NORTH AMERICA.

Alaska—Telegraph System. *National G. Mag.* **15** (1904): 357–361. **Mitchell.**
Building the Alaskan Telegraph System. By Captain W. Mitchell.

Canada. **Tyrrell and Dowling.**

Ann. Rep. Geol. Surv. Canada **13**, 1900 (1903): Reports F and FF, pp. 48, 44.

On the north-eastern portion of the District of Saskatchewan and adjacent parts of the districts of Athabasca and Keewatin. By J. B. Tyrrell. *Plate.*

On Geological Explorations in Athabasca, Saskatchewan, and Keewatin districts. By D. B. Dowling. *Map and Plate.*

Canada—British Columbia. **Morice.**

Du lac Stuart à l'Océan Pacifique. Par le R. P. A.-G. Morice. (Extrait du *Bulletin de la Société Neuchâteloise de Géographie*, tome xv., 1904.) Neutchatel: Imp. P. Attinger, 1904. Size 9½ × 6½, pp. 52. *Map and Illustrations. Presented by the Author.*

Mexico. **Farrington.**

Observations on the Geology and Geography of Western Mexico, including an account of the Cerro Mercado. By O. C. Farrington, PH.D. (Field Columbian Museum, Publication No. 89, Geological Series, vol. ii. No. 5.) Chicago, 1904. Size 10 × 6½, pp. 197–228. *Map and Illustrations. Presented by the Field Columbian Museum.*

Noticed in the Monthly Record for January (p. 95).

Mexico—Mitla. *J.R.I. Brit. Architects* **11** (1904): 513–526. **Johnson.**

The Ruins of Mitla, Mexico. By C. G. Johnson. *With Plans and Illustrations.*

North America—Ice. *J. Geology* **12** (1904): 232–236. **Tyrrell.**

Crystosphenes or Buried Sheets of Ice in the Tundra of Northern America. By J. B. Tyrrell. *With Illustration.*

Noticed in the *Journal* for November (p. 951).

United States. **Fuller.**

U.S. Geolog. Surv., Water-Supply and Irrigation Paper, No. **102** (1904): pp. 522.

Contributions to the Hydrology of Eastern United States, 1903. M. L. Fuller.

United States—Boundaries. *B.U.S. Geolog. Surv.*, No. 226 (1904): pp. 146. **Gannett.**

Boundaries of the United States and of the Several States and Territories, with an outline of the History of all important changes of territory (third edition). By H. Gannett. *With Maps.*

United States—Delaware. *B.U.S. Geolog. Surv.*, No. **230** (1904): pp. 16. **Gannett.**

A Gazetteer of Delaware. By H. Gannett.

United States—Geological Survey. **Walcott.**

Twenty-fourth Annual Report of the Director of the United States Geological Survey to the Secretary of the Interior 1902–3. Washington, 1903. Size 11½ × 8, pp. 302. *Maps. Presented by the U.S. Geological Survey.*

Includes a summary of geographical work in Alaska.

United States—Hydrology. **Newell.**

U.S. Geolog. Surv., Water-Supply and Irrigation Paper, No. **93** (1904): pp. 362.

Proceedings of First Conference of Engineers of the Reclamation Service. With accompanying papers, compiled by F. H. Newell. *With Diagram.*

Among the papers printed is one by I. W. McConnell on the grand cañon of the Gunnison.

United States—Louisiana. **Harris and Fuller.**

U.S. Geolog. Surv., Water-Supply and Irrigation Paper, No. **101** (1904): pp. 98.

Underground Waters of Southern Louisiana, by G. D. Harris. With discussions of their uses for water-supplies and for rice irrigation, by M. L. Fuller. *With Maps and Illustrations.*

United States—Maryland. *B.U.S. Geolog. Surv.*, No. **231** (1904): pp. 84. **Gannett.**

A Gazetteer of Maryland. By H. Gannett.

United States—Massachusetts. *J. Geology* **12** (1904): 198–214. **Clapp.**

Relations of Gravel Deposits in the Northern part of glacial Lake Charles, Massachusetts. By F. G. Clapp. *With Maps.*

United States—Massachusetts. *J. Geology* **12** (1904): 181–197. **Fuller.**

Ice-retreat in glacial Lake Neponset and in South-eastern Massachusetts. By M. L. Fuller. *With Map and Sections.*

United States—Virginia. *B.U.S. Geolog. Surv.*, No. **232** (1904): pp. 160. **Gannett.**

A Gazetteer of Virginia. By H. Gannett.

United States—West Virginia. *B.U.S. Geolog. Surv.*, No. 233 (1904): pp. 164. **Gannett.**
A Gazetteer of West Virginia. By H. Gannett.
The above belongs to a series of excellent gazetteers of the separate states of the American Union, all prepared by Mr. H. Gannett.

CENTRAL AND SOUTH AMERICA.

Argentine Republic—Mines. **Hoskold.**
Official Report upon the Mines, Mining, Metallurgy and Mining Laws, etc., etc., of the Argentine Republic. By H. D. Hoskold. Buenos Aires: South American Bank Note Company, 1904. Size 10½ × 7, pp. iv. and 474.

Bolivia and Brazil. *B. Oficina Nac. La Paz* 3 (1903): 626–636. ———
Tratado de limites entre Bolivia y el Brasil.

Bolivia—Oruro. **Blanco.**
Diccionario Geográfico de la Republica de Bolivia. Tomo Cuarto. Departamento de Oruro. Por P. A. Blanco. La Paz: 1904. Size 10½ × 7½. pp. 98 and cxvi. *Plan.*

Brazil. *Petermanns M.* 50 (1904): 260–266. **Ihering.**
Der Rio Juruá. Von Dr. H. v. Ihering.

Brazil. *Kolon. Z.* 5 (1904): 332–333, 351–353, 371–372. **Papstein.**
Kolonisation in den Missionen am Alto Uruguay, Südbrasilien. Von A. Papstein.

Brazil. *Rev. Centro Sci., etc., Campinas* 3 (1904): 90–95. **Krone.**
Grutas Calcareas do Valle da Ribeira. R. Krone. *With Illustrations.*

Brazil—Ethnology. *Globus* 86 (1904): 119–125. **Schmidt.**
Aus den Ergebnissen meiner Expedition in das Schingúquellgebiet. Von Dr. M. Schmidt. *With Illustrations.*

Brazil and British Guiana. ———
Monthly B. Internat. Bureau American Reps. 17 (1904): 620–623.
Boundary Award between Brazil and British Guiana.

Central America and West Indies. **Elliot.**
The Land and Sea Mammals of Middle America and the West Indies. By D. G. Elliot. (Field Columbian Museum, Publication 95, Zoological Series, vol. iv. parts i. and ii.) Chicago, 1904. Size 10 × 6½, pp. xx. and 850. *Illustrations. Presented by the Field Columbian Museum.*

Panama Canal. *Deutsch. G. Blätter* 27 (1904): 83–94. **Kürchhoff.**
Die Bedeutung des Panamakanals. Von D. Kürchhoff.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *Scottish G. Mag.* 20 (1904): 577–584. **Macdonald.**
Some features of the Australian interior. By R. M. Macdonald. *With Illustration.*

Australia Alps. *Petermanns M.* 50 (1904): 235–243. **Lendenfeld.**
Die einstige Vergletscherung der Australischen Alpen. Von Prof. Dr. R. v. Lendenfeld. *With Illustrations.*

Marianne Islands. *Globus* 86 (1904): 278–282. **Seidel.**
Saipan, die Hauptinsel der deutschen Marianen. Von H. Seidel.

Marianne Islands. *G. Anzeiger* 5 (1904): 217–220. **Seidel.**
Der geologische Aufbau der deutschen Marianen-Insel Saipan. Von H. Seidel.

New Guinea. *Tijds. K. Ned. Aard. Genoots. Amsterdam* 21 (1904): 879–890. **Ijzerman.**
De Nieuw-Guinea-Expeditie van het Koninklijk Nederlandsch Aardrijkskundig Genootshap. Door J. W. Ijzerman.
See note in the January number (p. 97).

New Guinea. *Tijds. K. Ned. Aard. Genoots. Amsterdam* 21 (1904): 998–1021. **Oosterzee.**
Eene verkenning in het binnenland van Noord-Nieuw-Guinea. Door L. A. van Oosterzee. *With Maps.*

Victoria. *P.R.S. Victoria* 17 (1904): 120–144. **Gregory.**
The Antiquity of Man in Victoria. By Dr. J. W. Gregory, F.R.S.

POLAR REGIONS.

Antarctic. *B.I.G. Argentino* **22** (1904): 144–160. **Delachaux.**
Antártida. E. A. S. Delachaux. *With Map.*
Discusses the geographical problems offered by the Antarctic.

Antarctic. **Pariset.**
Vers la terre polaire Australe. Par E. Pariset. (Extrait des *Mémoires de l'Académie des Sciences, Belles-Lettres et Arts de Lyon.*) Lyon: A. Rey, 1904. Size 11 × 7, pp. 134. *Maps. Presented by the Author.*
An historical sketch of efforts for the discovery of the southern regions.

Antarctic—Argentine Expedition. *B.I.G. Argentino* **22** (1904): 57–82. **Irizar.**
Partes oficiales del viaje de "La Uruguay." J. Irizar.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Cartography. *Deutsch. G. Blätter* **27** (1904): 95–116. **Wolkenhauer.**
Aus der Geschichte der Kartographie. Von W. Wolkenhauer.
A useful list of famous maps from the revival of interest in Ptolemy's geography in the last quarter of the fifteenth century to Mercator's time. Brief notes are given on special points for which the maps are noteworthy. The list is, however, by no means complete; thus we miss, among others, the various Desceliers maps of the second quarter of the sixteenth century, the Maiollo map of 1527, and the globe of Robert de Bailly of 1530.

Cartography. *Nature* **71** (1904): 159–161. **Beazley.**
The First True Maps. By C. R. Beazley.
An account of the early Portolani of the fourteenth century.

Cartography. **Hantzsch.**
Die Landkartenbestände der Königlichen öffentlichen Bibliothek zu Dresden. Nebst Bemerkungen über Einrichtung und Verwaltung von Kartensammlungen von V. Hantzsch. (Beihefte zum Zentralblatt für Bibliothekswesen, xxviii.) Leipzig: O. Harrassowitz, 1904. Size 9½ × 6½, pp. vi. and 146. *Price 6s.*
This will be noticed elsewhere.

Cartography—Reliefs. *B.S.G. Genève* **43** (1904): 103–110. **Perron.**
Reliefs à grande échelle. Par C. Perron.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Cosmography. *Math. u. Naturw. Berichte Ungarn* **19** (1901): 204–223. **Kövesligethy.**
Ueber die Entwickelung der Himmelskörper und das Alter der Erde. Von R. v. Kövesligethy.

Geophysics. **Omori.**
Note on the Relation between Earthquakes and Changes in Latitude. By F. Omori. (Publications Earthquake Investigation Committee in Foreign Languages. No. 18. Pp. 13–21.) Tōkyō, 1904. Size 10½ × 7½. *Diagrams.*

Glacial Epoch. **Pilgrim.**
Versuch einer rechnerischen Behandlung des Eiszeitproblems. Von Prof. Dr. L. Pilgrim. (Separat-Abdruck aus 'Jahreshefte des Vereins für Vaterl. Naturkunde in Württemberg,' Jahr. 1904, Bd. 60.) Stuttgart, 1904. Size 9 × 6, pp. 26–117. *Diagram. Price 4s.*
An attempt to elucidate the glacial problem by calculation from astronomical data.

Glaciers—Moraines. *Rev. G. Italiana* **11** (1904): 399–411. **Dainelli.**
Intorno alla nomenclatura delle morene secondo recenti studii. G. Dainelli.

Hydrography—Tables. **Knudsen.**
Conseil Perm. Internat. Explor. Mer, Publ. Circonstance, No. **11** (1904): pp. 24.
σ_t Tabelle. Anhang zu den 1901 herausgegebenen hydrographischen Tabellen. Von M. Knudsen.

Limnology—Fauna. *Math. u. Naturw. Berichte Ungarn* **19** (1901): 89–124. **Entz.**
Die Fauna der Kontinentalen Kochsalzwässer. Von Dr. G. Entz.

Meteorology—Rain. *Symons's Meteorolog. Mag.* **39** (1904): 161–165. **Mill.**
On the Unsymmetrical Distribution of Rainfall about the Path of a Barometric Depression. By Dr. H. R. Mill. *With Diagrams.*

Meteorology—South Atlantic. **Hepworth.**
Symons's Meteorolog. Mag. **39** (1904): 170–171.
The Relation between Pressure, Temperature, and Air Circulation over the South Atlantic Ocean. By Commander C. Hepworth, C.B.

Meteorology—Whirlwinds. *Mém. S.G. Genève* **43** (1904): 95–134. **Brunhes.**
Nouvelles observations sur le rôle et l'action des Tourbillons. Par J. Brunhes. Avec deux appendices par S. Squinabol et G. Dal Piaz. *With Plates.*

Oceanography. *C. Rd.* **139** (1904): 631–632. **Thoulet.**
Fonds marins de l'Atlantique nord, bancs Henderson et Chaucer. Note de M. Thoulet.

Oceanography. *Naturw. Wochenschrift* **3** (1904): 721–726. **Walther.**
Ueber Entstehung und Besiedelung der Tiefseebecken. Von Prof. D. J. Walther.

Oceanography. *Z. Ges. Erdk. Berlin* (1904): 484–497. **Hjort.**
Forschungsfahrten auf nordischen Meeren. Von J. Hjort.

Oceanography—Atlantic. *Ann. Hydrographie* **32** (1904): 353–362. **Meinardus.**
Ueber Schwankungen der nordatlantischen Zirkulation und ihre Folgen. Von Dr. W. Meinardus. *With Diagram. Also separate copy, presented by the Author.*

Oceanography—Guinea Current. ———
K. Nederlandsch Meteorologisch Instituut. No. 95. Observations Océanographiques et Météorologiques dans la Région du Courant de Guinée (1855–1900). I. Texte et Tableaux. II. Planches. Utrecht: Kemink & Zoon, 1904. Size 13 × 10, (Plates) 23 × 18½; pp. vi. and 116. *Presented by the K. Ned. Meteorolog. Institut.*

Seismology. **Sieberg.**
Handbuch der Erdbebenkunde. Von A. Sieberg. Braunschweig: F. Vieweg und Sohn, 1904. Size 9 × 6, pp. xviii. and 362. *Maps and Illustrations.* [To be reviewed.]

Terrestrial Magnetism. *Deutsch. G. Blätter* **27** (1904): 63–82. **Schütz.**
Die magnetischen Pole der Erde. Von Dr. E. H. Schütz.

Zoogeography—Whales. **True.**
Smithsonian Contributions Knowledge **33** (1904): pp. 332.
The Walebone Whales of the Western North Atlantic, compared with those occurring in European Waters; with some Observations on the Species of the North Pacific. By F. W. True. *With Plates.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Colonisation—Methods. *Z. Kolonialpolitik* **6** (1904): 684–713. **Pauli.**
Der Kolonist der Tropen als Häuser-, Wege- und Brückenbauer. Von C. Pauli. *With Illustrations.*

Commercial Geography. **Herbertson.**
[Commercial Geography of the World.] By Dr. A. Herbertson. London and Edinburgh: W. & R. Chambers, 1905. Size 7 × 5, pp. 152 and 268. *Maps. Price 3s. 6d. Presented by the Publishers.*

Economics. **Kropotkin.**
Fields, Factories, and Workshops or Industry combined with Agriculture and Brain Work with Manual Work. By P. Kropotkin. Fourth Edition. New York: G. P. Putnam's Sons; London: Sonnenschein & Co., 1904. Size 7½ × 5, pp. x. and 260. *Illustrations. Price 6d. net. Presented by the Author.*
A reprint of the suggestive series of essays first published in collected form in 1898.

Economics. **Lindeman.**
Urbegriffe der Wirtschaftswissenschaft Arbeit: Wert (Gebrauchs- und Tauschwert), Geld, Preis; Wirtschaft, Wirtschaftswissenschaft. Von Dr. M. Lindeman. Dresden: O. V. Böhmert, 1904. Size 9½ × 6½, pp. xii. and 248. *Presented by the Author.*
The author points out the importance of including commercial geography in the field of political economy.

Historical—Cabots. **Biggar.**

H. P. Biggar. The Voyages of the Cabots and of the Corte-Reals to North America and Greenland, 1497–1503. (Extrait de la *Revue Hispanique*, tome x.) Paris, 1903. Size 10 × 6½, pp. 114. *Maps. Presented by the Author.*

Historical—La Pérouse. *Nautical Mag.* **73** (1904): 683–693, 779–788. Holt.

Voyage of the French Frigates *Boussole* and *Astrolabe*. (From an English translation, published in 1798, of the papers arranged by order of the French Government.)

BIOGRAPHY.

Bishop. *Blackwood's Mag.* **176** (1904): 698–704. **Stewart.**

Some Recollections of Isabella Bishop. By A. G. Stewart.

Hudleston. *Geolog. Mag.* **1** (1904): 431–438. ———

Eminent Living Geologists: Wilfrid Hudleston Hudleston, F.R.S., etc. *With Portrait.*

Makaroff. *Deutsch. Rundschau G.* **26** (1904): 568–569. ———

Admiral Makarow. *With Portrait.*

Ratzel. *La G., B.S.G. Paris* **10** (1904): 103–108. **Brunhes.**

Friedrich Ratzel (1844–1904). Par J. Brunhes.

Stanley. *B.S.G. Lisboa* **22** (1904): 217–221. **Vasconcellos.**

Dois autographos de H. M. Stanley. Por E. de Vasconcellos. *With Facsimiles.*

The documents reproduced are the famous letter asking for food supplies on the arrival on the lower Congo in 1877, and a memorandum on the course of the journey down the great river, written a few days later.

GENERAL.

Antarctic Medallists. **Markham.**

List of Antarctic Medallists of the Royal Geographical Society. By the President, 1904. [MS.] Size 10½ × 9, pp. viii. and 44.

British Colonies. **Payne.**

Colonies and Colonial Federations. By E. J. Payne. London: Macmillan & Co., 1904. Size 8 × 5½, pp. xviii. and 266. *Maps. Presented by the Publishers.* [To be reviewed.]

Educational. *J. Manchester G.S.* **19** (1903): 193–204. **Bentley.**

Geographical Education. By J. H. Bentley. *Also separate copy.*

Geographical Readers—America. **Kelly and Glover.**

Round the World. America. By J. Kelly. Ditto. Australia. By G. L. Glover. London: T. C. & E. C. Jack, [*not dated*]. Size 7½ × 5, pp. 264 and 256. *Maps and Illustrations. Price* 1*s.* 6*d. each. Presented by the Publishers.*

These readers belong to a series which seems to have been carefully prepared, and by the help of generally well-chosen illustrations, does much to bring before the scholars the characteristic features of the countries described in a realistic way. Sufficient prominence is perhaps not always given in the text to an understanding of physical configuration as the basis on which the whole structure should be built, but the maps, with which the books are well provided, are a useful aid in this respect.

Geography. **Dodge.**

Dodge's Advanced Geography. By R. E. Dodge. Part I. The Principles of Geography. Part II. Comparative Geography of the Continents. Chicago, etc.: Rand, McNally & Co., [1904]. Size 9 × 8½, pp. 333. *Maps and Illustrations. Presented by the Publishers.* [To be reviewed.]

Writers and Places. **Sharp.**

Literary Geography. By William Sharp. London: Offices of the "Pall Mall Publications," 1904. Size 10½ × 7½, pp. xvi. and 248. *Maps and Illustrations. Presented by the Publishers.*

A collection of magazine articles descriptive of districts associated with famous writers. All are concerned in the main with portions of the British Isles, except the last, which treats of the Lake of Geneva.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria-Hungary. **Artaria.**

Artaria's Eisenbahn-u. Postkarte von Oesterreich-Ungarn. Vierte Neubearbeitung. 5 Auflage. Scale 1 : 1,500,000 or 23·6 stat. miles to an inch. Vienna : Artaria & Co., 1905. *Price* 2.20*k*. *Presented by the Publisher.*

Dalmatia. **Kassner.**

Regenverteilung an der Bucht von Cattaro. Von Prof. Dr. K. Kassner. Scale 1 : 200,000 or 3·1 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1904, Tafel 21. Gotha: Justus Perthes, 1904. *Presented by the Publisher.*

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from December 1 to 31, 1904.

4 miles to 1 inch:—

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14, 15; XXX. 4, 8, 12, 16; XXXII. 16; XXXV. 8, 12, 16; XXXIX. 4; XLII. 4; XLIII. 14; XLVIII. 9, 10, 11, 12, 13, 14; XLIX. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13; L. 1, 2, 5, 6, 9; LIII. 8, 12; LIV. 8, 9, 10, 11, 12, 16; LV. 1, 5, 9, 13. *3s. each.*

(*E. Stanford, London Agent.*)

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartographische Abteilung der K. Preuss. Landes-Aufnahme. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheet 290, Neuhaldensleben. Berlin, 1904. *Price* 1.50*m. each sheet.*

London. **Morden and Lea.**

Facsimile of Morden and Lea's Map of London, 1682, in 12 sheets. London: London Topographical Society, 1904.

The London Topographical Society has already issued several most interesting facsimiles of old plans of London, and it was their intention to publish a reproduction of the Agas map during the year 1904, but they have been unable to accomplish this, as it was found that the preparation involved more time and labour than would admit of any portion being ready during the year. They have, however, reproduced Morden and Lea's 'Prospect of London and Westminster,' which, although of a later date, is in some respects quite as interesting as the Agas map, especially as it was from a survey made soon after the rebuilding consequent upon the Great Fire; and, indeed, as will be seen from a note on the plan, St. Paul's cathedral was in course of reconstruction when the survey was made by "Wm. Morgan, His Majesties Cosmographer, 1681–2."

Pomerania. **Halbfass.**

Tiefenkarten hinterpommerscher Seen nach eigenen Lotungen im Sommer 1904, entworfen und gezeichnet von Dr. W. Halbfass. Scale 1 : 25,000 or 2·5 inches to one stat. mile. *Petermanns Geographische Mitteilungen*, Jahrgang 1904, Tafel 19. Gotha: Justus Perthes, 1904. *Presented by the Publisher.*

Spain and Portugal. **Albert.**

Mapa de los Ferrocarriles de España y Portugal por A. M. Albert. Con indices alfabeticos de todas las Estaciones, Apeaderos, Apartaderos y Cargaderos é indicacion del servicio que prestan los que lo tienen limitado. Scale 1 : 1,500,000 or 23·6 stat. miles to an inch. Madrid: P. Orrier, 1905.

An outline map without physical features, showing railways in different symbols in black. Numerous insets of special districts are given on enlarged scales, and the map is accompanied by an index.

ASIA.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 22 N.W., parts of Kathiawar and Kathiawar Agency and District Ahmedabad (Bombay Presidency), additions to 1902. 31 S.E., parts of districts Hissar and Ferozepore and Native States of Patiala (Punjab) and Bikaner (Rajputana Agency), additions to 1902. 32 S.E., parts of districts Hissar and Loharu State (Punjab), Jaipur and Bikaner States (Rajputana Agency), additions to 1891. 34 N.E., parts of district Ajmer and of Kishangarh, Jaipur, Tonk, Bundi, Udaipur, and Shahpura, Native States (Rajputana Agency), additions to 1903. 34 S.E., parts of district Ajmer and Native State of Udaipur, Jaipur, Kotah, Bundi, and Shahpura (Rajputana Agency), additions to 1903. 41 N.E., parts of districts Belgaum, Bijapur and Dharwar, and Kolhapur and Southern Maratha and Satara Agencies (Bombay Presidency), and district Lingsugur (Nizam's Dominions), 1903. 44 N.E., parts of districts Malabar and South Canara (Madras Presidency) and of Coorg, additions to railways to 1903. 44 S.E., part of district Malabar (Madras Presidency), additions to railways to 1903. 48 N.E., parts of districts Dehra Dun, Saharanpur, Garhwal, and Native State of Tehri Garhwal (U.P. Agra and Oudh), and districts Umballa, Karnal, and Native States of Sirmur, Patiala, and Kalsia (Punjab), additions to 1902. 49 S.E., parts of districts Gurgaon and Delhi (Punjab), Meerut, Bulandshahr, Muttra, Aligarh, and Moradabad (U.P. Agra and Oudh), additions to 1903. 51 N.E., parts of Native States Gwalior (C.I. Agency), Karauli, and Dholpur (Rajputana Agency), additions to 1904. 52 N.E., parts of districts Saugor (Central Provinces), and Jhansi (U.P. Agra and Oudh), and Native States of Gwalior (C.I. Agency), Tonk, and Jhalawar (Rajputana Agency), additions to 1901. 71 S.E., parts of districts Seoni, Mandla, Narsinghpur, Jubbulpore, and Balaghat (Central Provinces), additions to 1903. 72 N.E., parts of districts Nagpur, Seoni, Bhandara, Chhindwara, and Balaghat (Central Provinces), additions to 1903. 77 N.E., parts of

districts Nellore and Cuddapah (Madras Presidency), additions to 1899. 86 S.W., parts of districts Kheri, Sitapur, and Bahraich (United Provinces), and of Nepal, additions to 1903. 87 S.E., parts of districts Azamgarh, Gorakhpur, Basti, Fyzabad, Sultanpur, and Gonda (U.P. Agra and Oudh), additions to 1902. 90 S.E., parts of districts Sambalpur and Bilaspur (Central Provinces), and of Tributary State Sarguja (Bengal), additions to 1900. 91 S.E., parts of districts Raipur, Sambalpur, and Native State of Patna (Central Provinces), additions to 1903. 124 S.E., parts of districts Kamrup, Nowgong, Darrang, Cachar, Khasi, and Jaintia Hills, and Naga Hills (Assam), corrections to 1901. 125 N.W., parts of districts Kamrup, Sylhet, Khasi, and Jaintia Hills and Garo Hills (Assam), and of Mymensingh (Bengal), additions to 1903. 29, parts of districts Gujrat, Jhelum, Rawalpindi, Shahpur, Gujranwala, Gurdaspur, Kangra, and Sialkot (Punjab), and Kishtwar, Nowshera, Badrawar, and Jummu (Kashmir), additions to 1903. 54, parts of districts Hoshangabad, Nimar, Wardha, and Betul (Central Provinces), Amraoti, Akola, Buldana, and Ellichpur (Berar), Khandesh (Bombay Presidency), and of Native State Indore (C.I. Agency), additions to 1901.—Eastern Bengal Survey, 8 miles to an inch. Sheets: 11, parts of districts Darjeeling, Jalpaiguri (Bengal), and Goalpara (Assam), with Native States of Nepal, Sikkim, and Bhutan, additions to railways and boundaries to 1903. 15, parts of districts Tipperah, Noakhali, Chittagong Hill Tracts, and Native State Hill, Tipperah, additions to railway to June, 1898, 1903.—Western Bengal Survey, 8 miles to an inch. Sheets: 3, parts of districts Ranchi and Hazaribagh, the Garjat States, Chang Bhakhar, Koria, Sarguja, and Jashpur (Chota Nagpore Division), addition to railway to February, 1903. 4, Udepur, Gangpur, etc. (Garjat States of Chota Nagpore), and Athmallik (Orissa Tributary States), and part of district Ranchi (Bengal), additions and corrections to January, 1899, 1903. 6, districts Darbhanga, Muzaffarpur, and Champaran, and part of Nepal, additions and corrections to railways and boundaries to September, 1903.—Madras Presidency, 32 miles to an inch, additions to railways, roads, etc., to 1903, 1904.—Rajputana Agency, 16 miles to an inch. Second Edition, additions and corrections to boundaries, railways, etc., 1903; 2 sheets, 1904.—District Ahmedabad, 4 miles to an inch; 2 sheets, 1903.—District Nagpur (Central Provinces), 4 miles to an inch, 1903.—United Provinces of Agra and Oudh in May, 1903, 32 miles to an inch.—District Baradanki (U.P. Agra and Oudh), 4 miles to an inch, additions and corrections to 1902, 1903.—District Jubbulpore (Central Provinces), 4 miles to an inch, additions and corrections to roads, railways and boundaries to September, 1901, 1903.—District Sonthal Parganas (Lower Provinces, Bengal), 4 miles to an inch, additions and corrections to March, 1903.—Kangra, 2 miles to an inch; 4 sheets, 1903.—District Broach, 4 miles to an inch, 1904.—Assam Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 39, districts Kamrup, Darrang, and Nowgong, Seasons 1883-87 and 1897-98, 1903; (Preliminary Edition) 86, districts Darrang and Sibsagar, Seasons 1888-90 and 1898-99, 1903; 100, districts Sibsagar and Lakhimpur, Seasons 1888-92 and 1898-99, 1903; 131, parts of districts Lakhimpur, Sibsagar, and the Naga Hills, Season 1889-90, 1903.—Bengal Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 56, 85, district Saran, Seasons 1895-99, 1904; 67, parts of districts Ranchi, and Sirguja and Jashpur States (Chota Nagpore), Season 1865-66, correction to boundary to September, 1902, 1903; 110, districts Muzaffarpur and Champaran, Seasons 1893-96, corrections to 1903; 136, 166, 195, districts Cuttack and Puri, Seasons 1888-95 and 1895-96, 1903; 167, 197, district Puri, Seasons 1889-91 and 1894-96, 1904; 219, district Balasore, Seasons 1892-94, 1903; (Second Edition) 221, 222, districts Cuttack and Balasore, Seasons 1888-95, 1903; (Second Edition) 223, district Cuttack, Seasons 1888-89 and 1891-93, 1903; (Second Edition) 235, districts Sonthal Parganas and Birbhum, Seasons 1841-43 and 1849-51, 1903; 284, districts Burdwan and Nadia, Seasons 1853-56, 1903; 301, parts of districts Rajshahi, Dinajpur, and Malda, Seasons 1848-51 and 1857-60, 1903; 347, districts Mymensingh and Pabna, Seasons 1850-54, 1904; 348, districts Mymensingh, Dacca, and Pabna, Seasons 1850-54 and 1857-58, 1904.—Bombay Survey, 1 mile to an inch. Sheets: (Second Edition) 61, parts of Kathiawar Agency, Season 1873-74, additions to railways to 1893, 1903; 136, district Thana, Seasons 1881-83, 1902; 184, parts of Baroda State and of the Rewa Kantha Agency, Seasons 1883-85, additions to railway to 1902, 1903; 258, district Nasik, Season 1873-74, additions to railways to 1900, 1903.—Burma Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 112 (N.S.), districts Minbu and Magwe, Seasons 1891-92 and 1896-98, 1901; 153 (N.S.) 154, parts of districts Myingyan and Magwe, Seasons 1895-96 and 1901-02, 1903; 156 (N.S.), parts of districts Magwe and Minbu, Seasons 1892-93 and 1901-02, 1903; (Preliminary

Edition) 191 (N.S.), district Shwebo, Seasons 1892-96, 1903; 201 (N.S.) parts of districts Yamethin, Meiktila, and Magwe, Seasons 1894-95, and 1900-01, 1903; (Second Edition) 245 (N.S.), parts of districts Sagaing, Kyaukse, Myingyan, Meiktila, and Southern Shan States, Seasons 1889-92, 1898-99, and 1902, 1904; 284 (N.S.), parts of districts Meiktila, Yamethin, and Southern Shan States, Seasons 1890-94 and 1898-1901, 1903; 249 (N.S.), part of district Yamethin, Seasons 1894-95 and 1900-01, 1903; (Second Edition) 259 (N.S.), 260 (N.S.), parts of districts Pegu, Hanthawaddy, and Tharrawaddy, Seasons 1882-1902, 1903; (Second Provisional Edition) 296 (N.S.), parts of district Yamethin and Southern Shan States, Seasons 1894-96 and 1900-01, 1903; (Preliminary Edition) 302 (N.S.) district Toungoo, Seasons 1897-99, 1904; (Second Edition) 306 and 325, districts Pegu and Thaton, Seasons 1883-85 and 1894-96, 1904; 385 (N.S.), 389 (N.S.), 442, 510 (N.S.), 511 (N.S.), 512 (N.S.), parts of Southern Shan States, Season 1897-98, 1901-03, 1904; 539 and portion of 583 (N.S.), district Mergui, Season 1889-91, 1902; 433 (N.S.), parts of Northern Shan States, Season 1900-01, 1903.—Burma Survey, 4 miles to an inch. Degree Sheet 52, parts of the Northern and Southern Shan States, 1903.—Central India and Rajputana Survey, 1 mile to an inch. Sheets: 209, parts of States Jaura, Gwalior, Rutlam, and Sailana (C.I. Agency), and Banswara, Partabgarh and Khandu (Rajputana Agency), Season 1881-82, 1904; 347, parts of Gwalior (C.I. Agency), and Jhalawar (Rajputana Agency), Seasons 1864-66, additions and corrections to February, 1903; 352, parts of Gwalior, Rajgarh (C.I. Agency), and Tonk (Rajputana Agency), Season 1871-72, additions to roads to December, 1902, 1904; 367, 383 (Second Edition), part of Gwalior (C.I. Agency), Season 1862-64, additions to roads and railways to July, 1903, 1904; 389 (Second Edition), parts of Gwalior State (C.I. Agency) and Jhansi district (U.P. Agra and Oudh), Seasons 1870-72, 1895-6, 1903.—Central Provinces Survey, 1 mile to an inch. Sheet 106, district Jubbulpore, Season 1901-02, 1903.—Madras Survey, 1 mile to an inch. Sheets: 26, parts of districts Kadur and Shimoga (Mysore), Season 1881-82, additions and corrections to November, 1899, 1903; 51 and part of 32, part of district Mysore, Season 1883-84, additions to roads and railways to May, 1901, 1903; 106, parts of districts Bangalore and Tumkur (Mysore), Season 1876-77, additions and corrections to May, 1894, 1903.—North-West Frontier Province and Punjab Surveys, 1 mile to an inch. Sheet 57 (Second Edition), districts Bannu and Dera Ismail Khan (N.W.F.P.), district Mianwali (Punjab), Season 1874-78, 1903.—Punjab Survey, 1 mile to an inch. Sheets: 27*a* (Second Edition), parts of district Kohat and Peshawar Frontier, Season 1879-83, 1890-91, and 1897-98, 1903; 86, district Mianwali, Season 1878-79, additions and corrections to railways and boundary to 1901, 1903; (Preliminary Edition) 171, 172, district Montgomery (Rechna and Bari Doab), Season 1901-02, 1903; 243, part of district Hissar (Punjab) and Bikaner State (Rajputana Agency), Seasons 1867-68, 1876-78, 1883-84, additions and corrections to April, 1895, 1903; 253, district Ludhiana and Sikh States, Seasons 1885-87, additions to railways, canals, and village boundaries to 1903, 1904.—Sind Survey, 1 mile to an inch. Sheets: (Second Edition) 19*a* and 37, district Upper Sind Frontier and part of Kalat (Baluchistan), Seasons 1897-98 and 1899-1900, 1903; (Second Edition) 77, districts Dera Ghazi Khan (Punjab), Upper Sind Frontier, and part of Kalat (Baluchistan), Seasons 1892-93, 1897-98, 1900-01, 1903; 98, district Sukkur, Season 1902-03, 1903.—North-Western Provinces and Oudh Survey, 1 mile to an inch. Sheet 38, district Agra, Season 1872-73, additions and corrections to roads and canals to December, 1896, 1902.—United Provinces Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 67, district Bareilly, Season 1896-98, 1903; (Third Provisional Edition) 84, parts of districts Bareilly, Shahjahanpur, and Pilibhit, Seasons 1895-1900, 1904.—United Provinces of Agra and Oudh Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 85, 101 and part of 102, district Shahjahanpur, Season 1895-97, 1903; (Preliminary Edition) 100, districts Shahjahanpur and Pilibhit, Season 1895-99, 1903; 152, districts Sultanpur, Partabgarh, and Rae Bareli, Season 1859-64, additions and corrections to railway, roads, and boundaries to 1898, 1903.—North-Eastern Frontier Survey, 4 miles to an inch. Sheets: 30 N.E., parts of Yun-nan and Ssu-chuan Provinces (China), Seasons 1898-1900, 1903; 31 N.W., China, Yun-nan Province, Season 1899-1900, 1902.—Northern Trans-Frontier Survey, 4 miles to an inch. Sheet: 2 S.W. (Third Edition), parts of Wakhan and Chitral, Seasons 1880-85 and 1890-1900, 1904.—North-Western Trans-Frontier Survey, 2 miles to an inch. Sheets: 333, parts of Afghanistan and Baluchistan, Seasons 1878-81 and 1894-96, 1903; (Second Edition) 432, parts of Afghanistan, Mohmand Country and Peshawar district, Seasons 1863-98, 1902; (Second Edition) 443, parts of Waziristan and Bannu district, Seasons 1879-80 and 1894-97, corrections to September, 1902, 1903;

453, parts of Afghanistan, Baluchistan, and North-West Frontier Province, Seasons 1892-96, additions and corrections to roads and boundaries to May, 1902, 1903; 454, part of Baluchistan, Seasons 1884-91 and 1895-97, 1901.—North-Western Trans-Frontier Survey, 8 miles to an inch. Sheet: 14 (Second Edition), parts of Persia, Afghanistan, and Baluchistan, correction to boundary to October, 1902, 1903.—North-Western Trans-Frontier Survey, 4 miles to an inch. Sheets: 4 S.E., part of Persia, Seasons 1889, 1893-95 and 1899, 1903; 10 S.E., parts of Afghanistan and Russian Turkestan, Seasons 1884-86, additions to railways to March, 1903; (Second Edition) 12 S.W., parts of Afghanistan and Persia, Seasons 1884-86 and 1899, 1904; (Third Edition) 14 S.W., parts of Baluchistan and Eastern Persia, Seasons 1884-85, 1888-91, 1893-94, 1898-99, 1901-02, 1904; (Fifth Edition) 22 S.W., parts of South-Western Baluchistan, Seasons 1883-84, 1888-93, 1894-95, 1898-99, 1903; (Fourth Edition) 28 S.W., parts of Waziristan and Afghanistan, Seasons 1894-95 and 1897-98, 1903.—South-Eastern Frontier Survey, 4 miles to an inch. Sheet: 4 S.E. (Seventh Edition), Burma and China, Yun-nan Province, Seasons 1887-92, 1895-97, 1899-1900, 1903.—Assam, 8 miles to an inch. District Kamrup, 1903.—Bengal, 8 miles to an inch. Districts: 24 Parganas, corrected to 1901, 1902; Bogra, corrected to 1900, 1904; Champaran, corrected to 1899, 1904; Faridpur, corrected to 1900, 1904; Howrah, corrected to 1903, 1904; Khulna, corrected to 1901, 1904; Murshidabad, corrected to 1903, 1904; Puri, corrected to 1903.—Hyderabad Assigned Districts, 8 miles to an inch. District Wun, 1903.—North-West Frontier Province, 8 miles to an inch. District Hazara, 1904.—United Provinces of Agra and Oudh, 8 miles to an inch. District Jaunpur, corrected to 1901.—Railway System of India, 80 miles to an inch, corrected to April 30, 1904.—Map of the Sundarbans, 4 miles to an inch. 2 sheets, 1903.—Charts of Triangulation, 8 miles to an inch. China Field Force Survey, Season 1900-01, 1903.—North-Western Trans-Frontier Series. Sheets: 15 S.W., Seasons 1889-90 and 1892-95, 1904; 27 S.W., Seasons 1878-99, 1904. Chart of Triangulation, 2 miles to an inch. Sind, Sheet 82, Season 1900-01, 1903.—Sheet of Conventional Signs to be used on Topographical Maps for reduction, corrected to 1904.—Index to the Standard Sheets of Bengal, 50 miles to an inch, 1904.—Index to the Standard Sheets of the North-Eastern and South-Eastern Frontier Series, 135 miles to an inch, 1904.—Index to the Sheets of the North-Western Trans-Frontier, 144 miles to an inch, additions and corrections to October, 1903. *Presented by H.M. Secretary of State for India through the India Office.*

Shantung. **Anz.**

Aufnahmen im zentralen Gebirgsland der Provinz Schantung von W. Anz. Scale 1: 600,000 or 9·5 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1904, Tafel 18. Gotha: Justus Perthes, 1904. *Presented by the Publisher.*

Tian Shan. **Merzbacher.**

Uebersichtskarte des zentralen Tian-Schan zur Veranschaulichung der Reiserouten der Merzbacher'schen Expedition in den Jahren 1902 u. 1903. Auf Grundlage der russischen 40 Werstkarte, nach den vorläufigen Ergebnissen der, wahrend der Expedition gemachten Routenaufnahmen und Beobachtungen bearbeited von Dr. Gottfried Merzbacher. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Ergänzungsheft No. 149, Tafel 1. Gotha: Justus Perthes, 1904. *Presented by the Publisher.*

Transbaikalia. **Barannikoff.**

Topographical Map of Southern Transbaikalia. Compiled by Y. M. Barannikoff, under the supervision of Prof. V. A. Obrucheff and his assistants, A. P. Gerasimoff and Prince Hedroitz. Scale 1 : 840,000 or 13·2 stat. miles to an inch. St. Petersburg, 1904. [In Russian.]

This map is published with the twenty-fifth part of the 'Geological and Mining Explorations along the line of the Siberian Railway,' and is the result of surveys which have been carried on for years past in the region to the east of Lake Baikal, which is traversed by the Siberian railway. It consists altogether of four sheets and accompanying text, and was fully described by Prince P. Kropotkin in the *Geographical Journal* for October, 1904.

AFRICA.

Algeria. **Prudhomme.**

Carte provisoire de l'extrême-sud de l'Algérie (partie Occidentale), dressée par ordre de M. Jonnart, Gouverneur général, et executée par M. le Capt. Prudhomme, du Service géographique de l'Armée (October 1902—Mai 1903). Scale

1 : 800,000 or 12·6 stat. miles to an inch. 4 sheets. [Paris: Service géographique de l'Armée, 1904.] *Price 4 fr.*

The geographical positions of the principal places given on this map are based upon the triangulation, carried out for the Service Geographique de l'Armée and the astronomical observations of numerous French explorers—N. N. Flamand, Flatters, Foureau, Gautier, Jacob, Teisserene de Borl, Count Deleuze, etc. To these positions have been adjusted the route surveys and traverses of numerous officers and others who during recent years have travelled in this region.

Egypt. **Survey Department, Cairo.**

Topographical Map of Giza Province. Scale 1 : 10,000 or 6·3 inches to a stat. mile. Sheet S.E. No. 18–5. Cairo: Survey Department, Public Works Ministry, 1904. *Presented by the Director-General, Survey Department, Cairo.*

AMERICA.

Canada. **Surveyor-General of Canada.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Donald Sheet (90), West of Fifth Meridian, revised to March 13, 1902. Kamloops Sheet (95), West of Sixth Meridian, revised to September 30, 1899. Ottawa: Surveyor-General's Office, [1904]. *Presented by the Surveyor-General of Canada.*

GENERAL.

Classical Atlas. **Grundy.**

Murray's Small Classical Atlas. Edited by G. B. Grundy, M.A., D.LITT. London: John Murray, 1904. *Price 6s. Presented by the Publisher.*

Murray's 'Classical Hand Maps,' which have recently been published under the supervision of Mr. G. B. Grundy, are already well known and appreciated. One of their chief recommendations is that great care has been taken with the hills and general relief of the countries with which they deal, and the manner in which these have been represented by colour tinting, certainly enables the names to be clearly read. The natural features of a country are so closely connected with its history that too great importance cannot be attached to their representation upon classical maps, and it is satisfactory to see that this fact is fully acknowledged by Mr. Grundy in the present atlas, as well as the maps already referred to. The maps in this atlas are generally similar in style to the 'Classical Hand Maps,' and are commendably clear. Only those names that are really necessary and of importance are given. The atlas contains altogether fourteen maps, and includes an important sheet of plans of the principal battlefields in Greek and Roman history. There is also a good index. Its small price (6*s.*) should bring it within the reach of all, and it will doubtless be found of great assistance to students of history generally.

German Colonies. **Sprigade and Moisel.**

Grosser Deutscher Kolonialatlas. Bearbeitet von Paul Sprigade und Max Moisel. Herausgegeben von der Kolonial-Abteilung des Auswärtigen-Amts. Lieferung 4. Deutsch-Ostafrika. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Sheets: 20, Kilimatinde; 23, Neu-Langenburg. Die Deutschen Besitzungen im Stillen Ocean und Kiautschou. Sheet 25, General Map. Scale 1 : 15,000,000 or 236·7 stat. miles to an inch. Berlin: Dietrich Reimer (Ernst Vohsen), 1904. *Presented by the Publisher.*

The sheets of German East Africa include the country to the east and north of Lake Nyasa between 4° 30′ and 12° S. lat. and 32° 50′ and 37° 10′ E. long. The third sheet in this part is a useful general map of the Western Pacific, with the German and other European territorial possessions clearly distinguished of different colours. This latter is a mere outline map, but serves well as an index to the more detailed sheets which are given in the others.

World. **Cowell.**

Time Chart of the World. Patented by Edward Cowell. Instant time in 160 important cities. London: George Philip & Son, Ltd., [1904]. *Price 6d. net. Presented by the Publisher.*

The meridian of Greenwich is shown by a vertical line running down the centre of the diagram, and twelve other meridians are drawn at intervals of an hour on either side of this vertical line. The principal cities of the world are laid down in their

respective longitudes relative to the meridian of Greenwich without any regard to latitude. Along the top of the diagram a separate slip of paper is placed, through slots. Upon this are marked the hours of the day and night, and by placing the hour of the day in line with the meridian of any place, the time of all other places on the diagram can of course be easily read off. Many diagrams of various kinds have been devised for showing the relative times of different places in the world, and it is doubtful if anything is gained here over the well-known circular form, which is certainly more durable than this.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand Atlas. 100 Karten in Kupferstich herausgegeben von Justus Perthes' Geographischer Austalt in Gotha. 39 u. 40 Lieferung. Gotha: Justus Perthes, 1904.

These parts, which are in one cover, contain the following maps: No. 7, Europe, by C. Scherrer, scale 1 : 15,000,000; No. 66, Indo-China and the Malay Archipelago, by C. Barich, scale 1 : 12,500,000; Nos. 73 and 74, Africa, by H. Habenicht, scale 1 : 7,500,000, sheets 5 and 6.

CHARTS.

Chile. **Chilian Hydrographic Office.**

Chilian Hydrographic Chart No. 106, Golfo Corcovado: estero Palvitao, rio Yelcho, ensenada Chaiten. Scale 1 : 50,000 or 1·3 inch to a stat. mile. Valparaiso: Oficina Hidrografica, Marine de Chile, 1904. *Presented by the Chilian Hydrographic Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for December, 1904, and January, 1905. Washington: U.S. Hydrographic Office, 1905. *Presented by the U.S. Hydrographic Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for January, 1905. London: Meteorological Office, 1904. *Price* 6*s. Presented by the Meteorological Office, London.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for January, 1905. Washington: U.S. Hydrographic Office, 1904. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Argentine and Paraguay.

Six photographs of Northern Argentine and Paraguay. *Presented by Allan Brodie, Esq.*

These photographs are all interesting, but those of the Toba Indians are specially welcome to our collection.

(1) Government House, Formosa, Argentine Chaco; (2) A wood-cutting establishment in the Argentine Chaco; (3) Ruins of the church of Humayta, Paraguay; (4) A group of Toba Indians; (5) A Toba brave; (6) A tame Indian of the Toba tribe.

Egyptian Sudan. **Kearney.**

Sixty photographs of the White Nile and its tributaries, taken in September, 1903, by Mr. J. Kearney, under the direction of Captain H. G. Lyons, R.E., Director-General, Egyptian Survey Department, Cairo. *Presented by Sir William Garstin,* G.C.M.G.

These photographs were taken by Mr. J. Kearney, of the Egyptian Survey Department, during the time of flood in September, 1903. They are remarkably good specimens of platinotypes, and, as may be judged from the titles, are most characteristic of the region. Some of the views of the river-banks, papyrus growth, etc., are of special interest, as are also the native types.

(1) Cliff close to site of old Austrian mission, Gondokoro; (2 and 3) Looking upstream, Gondokoro; (4 and 5) View showing Nilometer, with river-gauge, Gondokoro; (6) Collector's house and office, Gondokoro; (7) Village outside Gondokoro; (8) Another village, Gondokoro; (9) Wives of Uganda (Sudanese) soldiers; (10) Lado, landing-place; (11) General view, Lado; (12) Landing-place at high flood, Mongalla; (13) Commandant's quarters, Mongalla; (14) Mongalla, Gebel Lado in distance; (15)

Sudanese soldiers' quarters, Mongalla; (16) View near landing-stage, Kiro; (17) Cliff of east bank of Bahr-el-Jebel, looking up-stream, Kiro; (18) European quarters, Kiro; (19) Congo soldiers' quarters, Kiro; (20) Congo women labourers, Kiro; (21 and 22) Sudd-cutting party's wooden station above Bor; (23) Euphorbia; (24) Village near Bor; (25) General view of Ghaba Shambe; (26) Group of Dinkas, Ghaba Shambe; (27 and 28) Papyrus, Bahr-el-Jebel opposite Hellet-en-Nuer; (29) Bahr-el-Jebel at Hellet-en-Nuer; (30) The Rohl, possible mouth of, entering Bahr-el-Ghazal; (31) Bahr-el-Ghazal, about 30 kilometres west of Lake No; (32) Bahr-el-Ghazal, blocked with grass sudd; (33 and 34) Floating sudd in the White Nile; (35) Shipping fuel; (36) Bahr-el-Zaraf, showing four hills forming Gebel Zaraf; (37–39) Sobat river, from Amerian Mission Station of Doleib Hilla; (40) Group of Shilluks, Sobat river; (41 and 42) Three Shilluks, Sobat river; (43) Taufikia; (44) Native fishing, Taufikia; (45) Group of Shilluks, Taufikia; (46) Commandant Macnaghten, Taufikia; (47 and 48) Villages on White Nile, south of Kodok; (49) Mr. Craig preparing to measure a section of White Nile; (50) In the village of Kodok; (51) El Dueim on the White Nile; (52) Public gardens, Khartum; (53) Governor-General's palace, Khartum; (54) Post Office, Khartum; (55) Shilluk natives of the Lollé watching bird-shooting; (56) Renk, wood station, White Nile; (57) Shilluks on Sobat river; (58–60) Shilluks in dug-out.

Portuguese East Africa. **Reid.**

Twenty-five photographs of Gorongoza and Sheringoma territories, Portuguese East Africa, taken by R. L. Reid, Esq. *Presented by R. L. Reid, Esq.*

The expeditions during which these photographs were taken were described in the *Geographical Journal* for last month. Although immediately to the north of the Beira railway, the region through which Mr. Reid travelled is very imperfectly known, hence the photographs are of special value.

(1) View of interior of old Portuguese fort; (2) Portuguese store, Makaia; (3) View in midstream, Urema river, showing difficulty of travelling; (4) The turning-point of the Urema river; (5) Baobab tree on the M'Kodza river; (6) Borssua palm; (7) The "village blacksmith," Garopa; (8) Camp at Nyapiriri; (9) Camp at Inhambwe; (10) Camp at Nyabava; (11) Camp at Fontesvilla; (12) Some of the sport handed over to the Australian Government; (13) Buffalo; (14) Hippopotamus; (15 and 16) Crocodiles; (17) Eland; (18) Water-buck; (19) Lioness; (20) Cheeta; (21) Sable antelope; (22) Reedbuck; (23) Warthog; (24) Herd of Wildebeest on the Pungwe plains; (25) Hartebeest.

Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder, herausgegeben von Dr. G. Karsten und Dr. H. Schenck. Zweite Reihe. Heft 3. Mexikanische Nadelhölzer. Von Dr. E. Stahl. Heft 4. Nordmexikanische Xerophyten. Von Dr. E. Stahl. Heft 5–7. Characterbilder mitteleuropaischer Waldbäume. I. Von Dr. Ludwig Klein. Jena: Gustav Fischer, 1904.

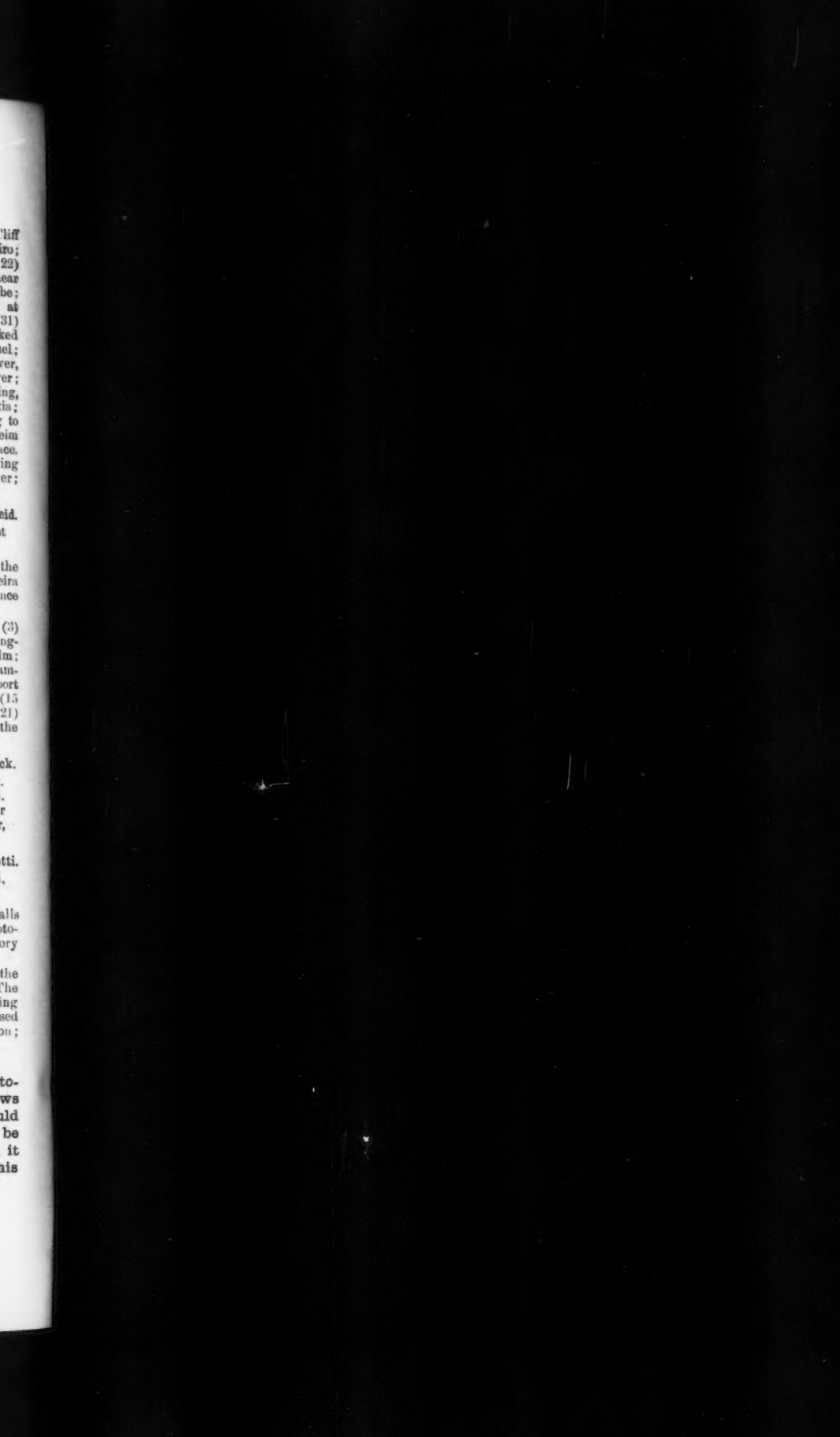
Victoria Falls. **Pedrotti.**

Nine photographs of the Victoria Falls, Zambezi river, taken by Mr. L. Pedrotti, Bulawayo. *Presented by A. J. C. Molyneux, Esq.*

An excellent series of large-size photographs, showing different views of the falls and characteristic vegetation of their vicinity. The positions from which the photographs have been taken were evidently carefully selected, with the most satisfactory result.

(1) View on the Zambezi, looking down-stream towards the falls; (2) View on the Zambezi, above the falls; (3) View looking into chasm from its western end; (4) The Grand falls; (5) View of falls seen through the jaws of the gorge; (6) View looking into chasm from eastern end; (7) View from second eastern promontory over depressed and narrow portion of "Knife Edge," with falls beyond; (8) View of bend in cañon; (9) View in rain-forest.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

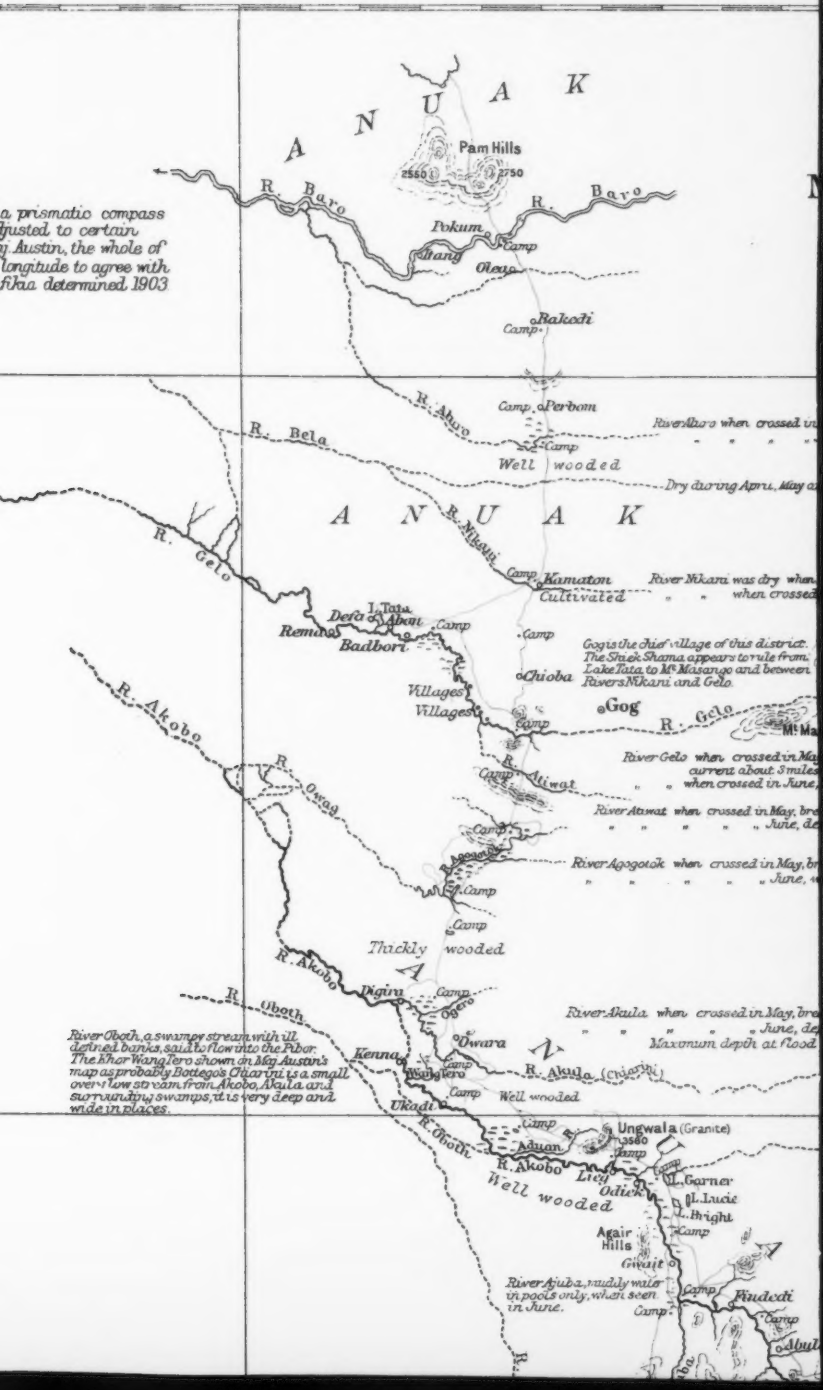


Note.

This map is drawn from a pri
survey by Mr. B.H. Jessen, adjusted
points in the survey by Maj. Aust
which has been altered in longitu
the telegraphic value of Taufiaa

8

7



a prismatic compass
justed to certain
y Austin, the whole of
longitude to agree with
fika determined 1903

EGYPTIAN SUDAN AND ABYS

SKETCH MAP
showing
THE ROUTES
OF
Mr W.N. Mc MILLAN'S EXI
1904
from a drawing by B. H. Jesse
(Engineer of the Expedition.)
Nat. Scale 1:1,000,000 or 15.78 Statute Mile
10 5 0 10 20

Route of Expedition ——
Heights in Feet

en crossed in May, breadth 15 to 30 feet, depth 3 feet.
„ „ June, „ 60 feet, „ 10 feet, with strong current.

April, May and June.

was dry when crossed in May, but with two waterholes at Kumutun.
when crossed in June had water in pools.

his district.
to rule from.
and between

Mt Masango

crossed in May, breadth 90 to 240 feet, banks 20 to 30 feet high.
about 3 miles, depth of water 3 to 10 feet.
ssed in June, „ „ „ 15 to 20 feet with strong current.

ed in May, breadth 9 to 30 feet with shallow running water.
„ June, depth of water 10 feet with good current.

ssed in May, breadth 15 to 24 feet, banks 10 feet high, sluggish current.
„ June, was full, with good current.

d in May, breadth 15 to 45 feet, banks steep, water shallow and current slow.
„ June, depth of water 2 to 6 feet with good current.
pth at flood about 15 feet, this river is undoubtedly Bottego's Chiarini.

GURAFARDA

Double Peak
6739

Morg Hill
6160

Double Peak
7273

Mc Bocol
7050

Findeti

Camp

Abula

Base Hill
6223

BYSSINIA

EXPEDITION

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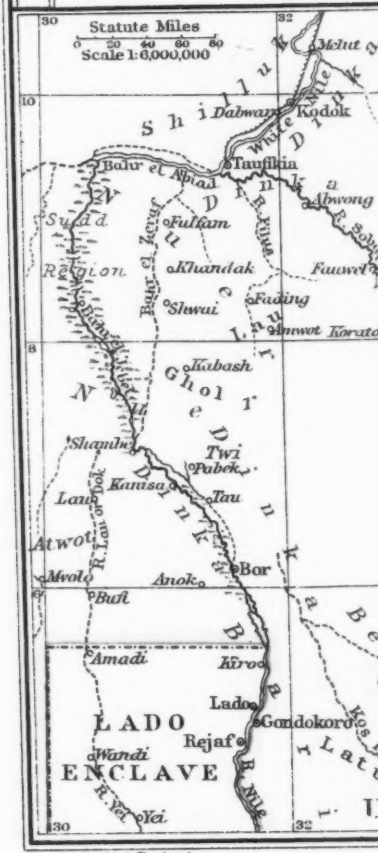
m.)

Miles·1 Inch

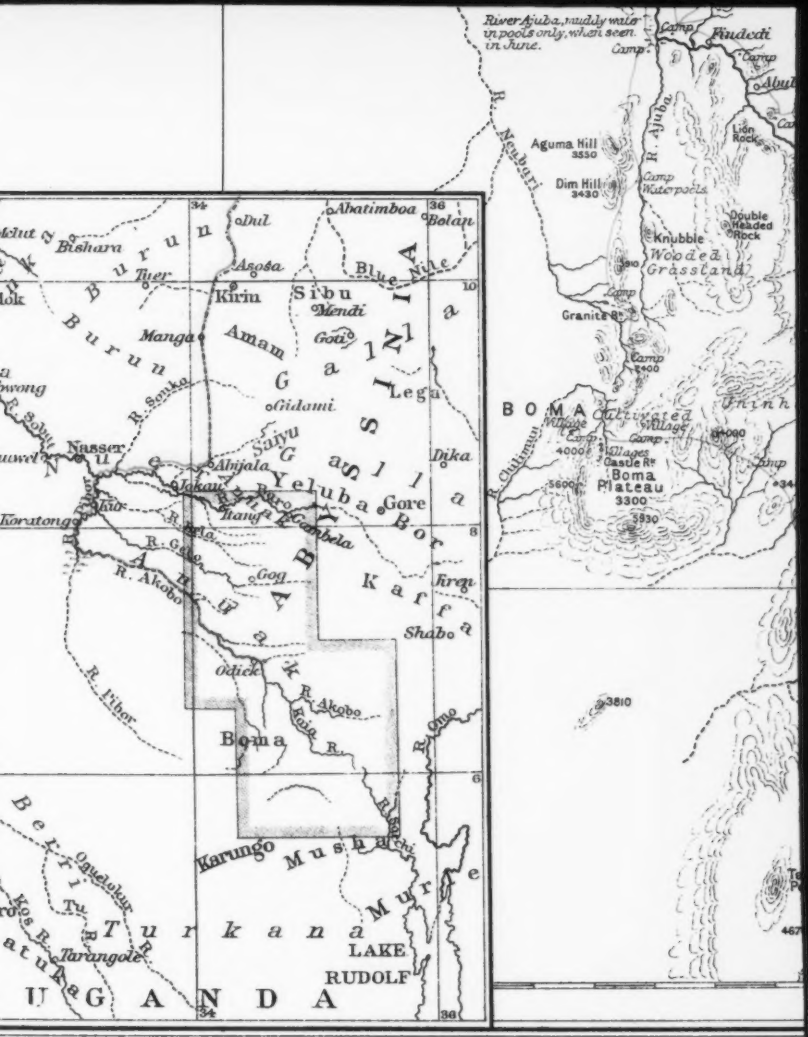
20 30

8

7



Secant Conical Projection.



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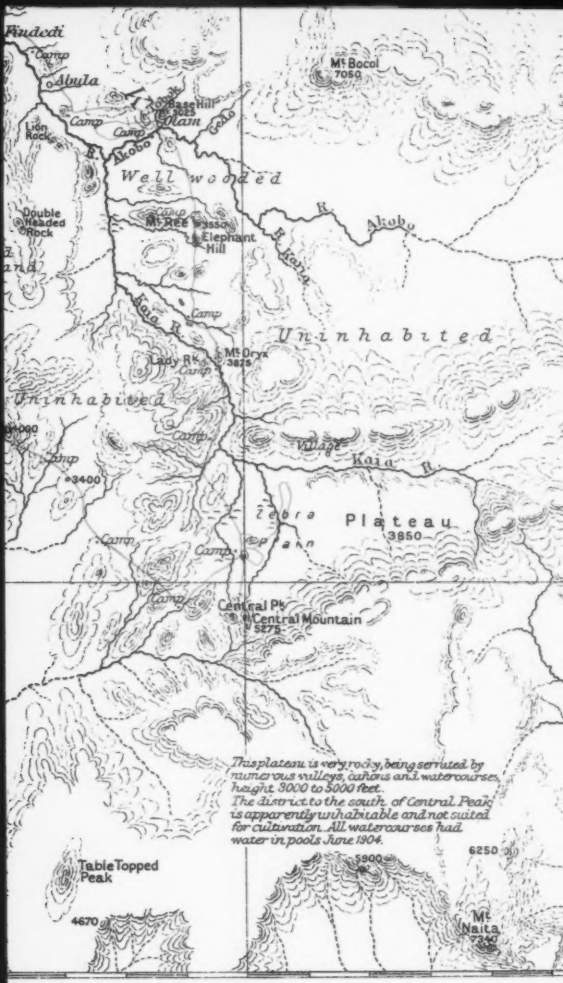
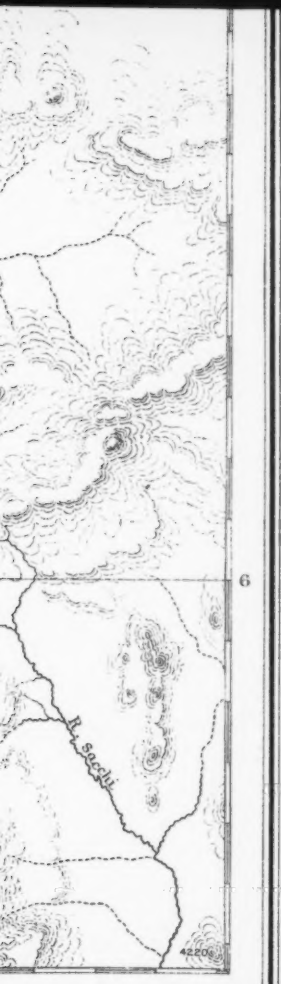


Society

George Philip & Son, L



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